

From the Department of Dental Medicine

Karolinska Institutet, Stockholm, Sweden

COGNITIVE BEHAVIORAL THERAPY FOR CHILDREN AND ADOLESCENTS WITH DENTAL PHOBIA

Shervin Shahnava



**Karolinska
Institutet**

Stockholm 2016

All previously published papers were reproduced with permission from the publishers.

Published by Karolinska Institutet

Printed by AJ E-print AB

Cover illustration by Robin Ejnebrand

© Shervin Shahnavaaz 2016

ISBN 978-91-7676-500-5

Cognitive Behavioral Therapy for Children and Adolescents with Dental Phobia

THESIS FOR DOCTORAL DEGREE (Ph.D.)

Shervin Shahnavaz

Principal supervisor:

Göran Dahllöf
Professor
Karolinska Institutet
Department of Dental Medicine
Division of Pediatric Dentistry

Co-supervisors:

Erik Hedman
Associate Professor
Karolinska Institutet
Department of Clinical Neuroscience

Lena Reuterskiöld
Assistant Professor
Stockholm University
Department of Psychology

Margaret Grindefjord
DDS, PhD, senior consultant
Eastmaninstitutet
Public Dental Service
Stockholm County AB

Viktor Kaldo
Associate Professor
Karolinska Institutet
Department of Clinical Neuroscience

Opponent:

Magnus Hakeberg
Professor
University of Gothenburg
Sahlgrenska Academy
Institute of Odontology
Department of Behavioral
and Community Dentistry

Examination Board:

Tiril Willumsen
Professor
Oslo University
Faculty of Dentistry
Department of Pediatric Dentistry
and Behavioural Science

Ulla Wide Boman
Associate Professor
University of Gothenburg
Sahlgrenska Academy
Institute of Odontology
Department of Behavioral and
Community Dentistry

Louise von Essen
Professor
University of Uppsala
Department of Public Health and Caring
Sciences, Clinical Psychology in Healthcare

For all children and young people suffering from fear

ABSTRACT

Background: Dental phobia is a disabling and clinically significant fear that interferes with the dental care necessary for a child's or adolescent's well-being. In fact, the definition of oral health in children and adolescents stresses, not only sound and well-functioning dental and oral structures, but also an absence of dental fear and anxiety. Cognitive behavioral therapy (CBT) is an evidence-based psychological treatment for specific phobias that has been used, to a limited extent, in pediatric dental care. Guided internet-based CBT (ICBT) is a variant of CBT that has emerged as an efficacious treatment for many psychiatric disorders, with results similar to face-to-face CBT. At the time of these studies, this new form of CBT had not been tested for dental phobia.

Aims: The purpose of this thesis was to (i) explore how school-aged children and adolescents, and their parents, experience and benefit from CBT for dental phobia (Study I), (ii) test the hypothesis that CBT is more efficacious than treatment as usual for dental phobia in school-aged children and adolescents (Study II), and (iii) test the hypothesis that psychologist-guided ICBT improves the ability of school-aged children and adolescents to manage dental phobia, while also testing the feasibility and acceptability of a novel ICBT for pediatric dental phobia (Study III).

Methods: The studies used both qualitative and quantitative research methods. Study I involved telephone interviews of 12 children (7–18 years) who had received CBT and one parent of each participant, with data collected and analyzed using qualitative methods. Study II employed a randomized controlled design to evaluate 30 children referred from general dentistry to pediatric specialist clinics with a diagnosis of dental phobia. These children were randomized to either CBT or treatment as usual. Psychologists provided 10 hour-long sessions of CBT, based on a structured treatment manual. The primary outcome measure was the Behavior Avoidance Test (BAT). Other assessments included in Study II measured diagnostic status, fear, and self-efficacy. Study III was an open trial with parent-referred participants. It included 18 participants (8–15 years) with a diagnosis of dental phobia. Participants received psychologist-guided ICBT comprising 12 chapters of texts, animations, and dentistry-related video clips. The treatment also included visits and training at dental clinics and participants received an exercise package of dental instruments. The primary outcome measure for Study III was the picture-based BAT. Other assessments for dental phobia included in the study measured the diagnostic status, fear, negative thoughts, and child and parental self-efficacy. Assessments in Studies II and III occurred before treatment (baseline) and immediately after treatment (3 months), as well as at a 1-year follow-up. Study

II analyzed both within-group and between-group changes, while Study 3 only analyzed within-group changes.

Results: Analysis of the interviews in Study I showed that CBT led to a perspective shift, which means that children experienced mastery, feelings of safety, and reduced fear in a dental context. According to the participants, the new experiences of dental care was mediated by CBT and arose from gradual exposure, increased autonomy and control, therapeutic alliance, changed appraisal, reduced anticipatory anxiety, and access to new coping strategies. Overall the parents' and children's experiences of CBT were positive. Study II showed larger improvements in the CBT group compared to treatment as usual. Results were statistically and clinically significant in both the primary and secondary outcome measures, both after treatment and at the 1-year follow-up. We found a large between-group effect size for the primary (Cohen's $d = 1.4$ at post-treatment and 1.9 at the 1-year follow-up) and secondary outcome measures. Results of Study III also showed large within-group effect sizes for the primary (Cohen's $d = 1.4$ and 1.5) and secondary outcome measures. Within-group improvements for participants were statistically and clinically significant. Average clinician support time during the 12 weeks was 5.4 ± 2.3 hours per participant and, on average, patients completed 9.2 ± 3.3 treatment modules. Study III showed that ICBT for pediatric dental phobia is a feasible and acceptable treatment.

Conclusions: School-aged children and adolescents with dental phobia who received CBT could benefit from the treatment. They experienced mastery, reduced fear, and increased feelings of safety, which helped them to change their view of dentistry and their own potential (perspective shift). CBT was more efficacious than treatment as usual. Children and adolescents in the CBT group improved more in their ability to manage dental procedures, and showed reduced anxiety and increased self-efficacy. Children and adolescents participating in a novel psychologist-guided internet-based CBT improved their ability to manage procedures in dental care. The children's and adolescent's dental fear and negative thoughts decreased while both participants and parents experienced increased self-efficacy. CBT is an efficacious treatment for children and adolescents with dental phobia and should be made accessible in pediatric dentistry. ICBT seems to have similar effects as face-to-face CBT. It has the potential to increase access to evidence-based psychological treatment. Important advantages that enable increased accessibility are that ICBT requires a limited amount of therapist time, that large geographic distances distance between therapist and patient is no obstacle, and that it does not require access to specialist pediatric dental care. The efficacy of ICBT needs to be confirmed in future randomized controlled trials.

LIST OF SCIENTIFIC PAPERS

- I. Shahnnavaz S, Rutley S, Larsson K, Dahllöf G. Children and parents' experiences of cognitive behavioral therapy for dental anxiety - a qualitative study. *Int J Paediatr Dent* 2015; 25(5): 317–326.
- II. Shahnnavaz S, Hedman E, Grindefjord M, Reuterskiöld L, Dahllöf G. Cognitive behavioral therapy for children with dental anxiety: A randomized controlled trial. *JDR Clinical & Translational Research* 2016;1(3):234–243.
- III. Shahnnavaz S, Hedman E, Hasselblad T, Kaldo V, Reuterskiöld L, Dahllöf G. Internet-based cognitive behavioral therapy for children and adolescents with dental anxiety - An open trial. In manuscript.

CONTENTS

Introduction	1
Fear, anxiety, and phobia in dentistry	1
Dental behavioral management problems	1
Importance of the child's perspective	2
Etiology of dental phobia	2
Clinical features and consequences of dental phobia	3
Assessment of dental phobia	5
Cognitive behavioral therapy	6
Internet-based cognitive behavioral therapy	8
Parental role	9
Summary	10
General aims	11
Empirical studies	12
Study I: Children and parents' experiences of cognitive behavioral therapy for dental anxiety - a qualitative study	12
Aim	12
Participants and methods	12
Results	13
Study II: Cognitive behavioral therapy for children with dental anxiety: a randomized controlled trial	14
Aim	14
Participants and Methods	14
Results	15
Study III: Internet-based cognitive behavioral therapy for children and adolescents with dental anxiety - an open trial	17
Aims	17
Participants and methods	17
Results	19
Summary tables and figures Study II & Study III	21
General discussion	24
Efficacy of CBT for pediatric dental phobia	24
Methodological considerations	26
Methodological limitations	34
Clinical implications, barriers, and further directions	36
Conclusions	43
Acknowledgments	44
References	48
Original papers I-III	
Appendix 1-2	

LIST OF ABBREVIATIONS

CBT	Cognitive Behavioral Therapy
ICBT	Internet-Based Cognitive Behavioral Therapy
cCBT	Computerized Cognitive Behavioral Therapy
TAU	Treatment as Usual
DA	Dental Anxiety
BAT	Behavior Avoidance Test
PG-BAT	Picture-Guided Behavior Avoidance Test
CFSS-DS-C	Child Fear Survey Schedule–Dental Subscale-Child version
CFSS-DS-P	Child Fear Survey Schedule–Dental Subscale-Parental version
SEQ-SP	Self-Efficacy Questionnaire for Specific Phobias
P-SEQ-DA	Parental Self-Efficacy Questionnaire for Dental Anxiety
CNTD	Children's Negative Cognitions in Dentistry
IPSC	Injection Phobia Scale for Children
DAWBA	Developmental and Wellbeing Assessment
K-SADS-PL	Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version
SCI-DA	Structured Clinical Interview for Dental Anxiety
RCT	Randomized Controlled Trial

INTRODUCTION

FEAR, ANXIETY, AND PHOBIA IN DENTISTRY

Fear and anxiety are unpleasant but normal and evolutionarily adaptive psychological responses to threat. While fear is often associated with a present and external threat, anxiety is less identifiable and often relates to internal stimuli, thoughts, and imagination. Phobia, however, is a maladaptive fear or anxiety that leads to overvaluation of a threat. A person with phobia overestimates the significance of a threat and the likelihood that a feared catastrophic situation will occur (Barlow, 2002; LeDoux, 2016; Öhman & Mineka, 2001). When a person detects real or potential threats to survival and well-being, they activate a defensive survival circuit in the brain. This defense response is global, activating the whole organism and its resources to cope with the danger, including the brain's defensive motivational, cognitive, and affective systems and regions that control the widespread release of chemical signals, including neuromodulators and hormones (LeDoux, 2016).

The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) classifies dental phobia as a form of specific phobia and is included in the anxiety disorder cluster (American Psychiatric Association, 2000). The DSM-IV defines specific phobia as a persistent, irrational, and intense fear of a specific object or procedure (such as a specific procedure in dentistry) persisting for at least 6 months. Features of specific phobia remain the same for children and adolescents in the DSM-5, which is the latest version of the DSM (American Psychiatric Association, 2013). Dental literature, however, does not follow DSM-IV criteria and overall does not differentiate between fear, anxiety, and phobia (Klingberg & Broberg, 2007). The dental literature uses these terms interchangeably to describe maladaptive and strong negative feelings associated with dental treatment or anticipation of dental treatment. A systematic review of different prevalence studies based on this definition showed that about 9% of children and adolescents suffer from dental fear and anxiety (Klingberg & Broberg, 2007).

DENTAL BEHAVIORAL MANAGEMENT PROBLEMS

An important challenge in pediatric dentistry is to differentiate between dental behavior management problems (DBMP) and dental phobia. In the pediatric dentistry literature DBMP refers to a large group of patients (9%), mostly pre-school children who do not cooperate with dental health staff but who do not necessarily have dental fear (Klingberg & Broberg, 2007). Patients with DBMP show disruptive, uncooperative behavior that make dental care difficult or impossible. Dentists may therefore erroneously view the child's inability to

cooperate as dental phobia. The literature indicates, however, that only 27% of children and adolescents with DBMP also show dental fear, while 61% of those with dental fear exhibit cooperation problems (Klingberg & Broberg, 2007).

Arnrup (2003) identified four categories of children with DBMP: (a) non-fearful, extrovert, outgoing, (b) fearful, extrovert, outgoing (c) fearful, inhibited, and (d) externalizing, impulsive. Of these four groups, it is likely that the participants studied in the present thesis would belong to groups (b) or (c) in Arnrup's classification. Some researchers and clinicians have used sedation methods and psychological techniques, such as Tell-Show-Do and behavioral shaping, in order to manage DBMP of their patients and make pediatric dental care possible (Holst, 1988; Koch & Poulsen, 2009).

IMPORTANCE OF THE CHILD'S PERSPECTIVE

DBMP represents the adult perspective and their view of the behavior of younger persons. Thus, it does not necessarily correspond with children's or adolescents' overall evaluation of the situation or their experience of fear and suffering. The literature indicates that focus on so-called child perspective is very limited in pediatric dentistry. For example, Marshman found that in 7% of studies children were involved in the research to some extent and only in 0.3% of published articles were children an active participant with their perspective explored (Marshman et al., 2007).

Ignoring the child's perspective that is, not paying enough attention to the child's feelings and thoughts about dental care, risks erroneously classifying fearful children as having DBMP. Conversely, dentists may over-diagnose dental phobia because they perceive all behavioral problems relating to dental care as signs of dental phobia. In this context, using interviews and questionnaires specifically designed to assess dental phobia is important.

ETIOLOGY OF DENTAL PHOBIA

Dental phobia has a multi-factorial etiology and is related to *personal factors*, *external/social factors*, and *dental factors*. Dental phobia often has its origins in childhood or adolescence (Willumsen, Haukebo, & Raadal, 2013). Many children show dental fear and DBMP, particularly during early childhood. Most of these reactions, however, fall within the normal range of childhood responses to new and challenging situations such as dentistry. *Personal factors* that can increase vulnerability to developing a phobia include mental or developmental disorders, genetic variables that affect both anxiety level and temperament (e.g., shyness), activity level, and impulsivity. Researchers have found a positive relationship

between general fears and dental fears. Furthermore, younger children experience both a greater number of fears and a greater intensity of fear (Klingberg & Broberg, 2007). Negative and traumatic life events such as sexual abuse and experiencing or witnessing torture, war, or accidents (e.g. traffic or ski accidents) are other personal experiences that increase vulnerability to fear in a dental situation, which may include trauma-related triggers such as pain and lack of control (Willumsen et al., 2013).

External factors include parental dental anxiety, model learning of dental phobia from others, and factors and vulnerability related to the social situation of the child's or adolescent's family. Culturally mediated attitudes toward dentistry and cultural representations of dentists in media and popular culture (films, musicals, etc.) are other external factors that can strengthen fear (Scambler, 2016; Shahnava, 2012; Thibodeau & Mentasti, 2007).

Dental factors often relate to experience of painful dental procedures. Dental phobia in these cases is mediated by classical conditioning where dentistry, all of it or some part of it (such as injections, drilling, or the dental chair) become associated with pain, eliciting fear, and avoidance. Research shows that acquisition of dental phobia in most cases seems to be mediated by classical conditioning (Öst & Hugdahl, 1985) and maintained by operant conditioning, often in the form of avoidance (Carter, 2014). In many cases, there is a close association between dental phobia and a strong fear of blood, injection, or injury (Vika, Skaret, Raadal, Öst, & Kvale, 2008).

Vaccinations are a common, painful needle procedure, experienced throughout life. Though several strategies available to ease this pain are available (Birnie et al., 2015; Hedén, Von Essen, & Ljungman, 2009), they are seldom implemented. This leads to unnecessary pain and causes patients to associate needle procedures with significant distress in the future (McMurtry et al., 2015). Thus there is a major risk that fear acquired in a healthcare context will be transferred to dentistry and expressed as an intraoral injection phobia and avoidance of local anesthetic, which in turn increases the risk of a painful dental experience that will result in dental phobia.

CLINICAL FEATURES AND CONSEQUENCES OF DENTAL PHOBIA

The vicious circle of dental anxiety is a theoretical model used in the dental literature to analyze and understand the consequences of dental phobia (Berggren, 1984). According to this model, a circle of avoidance, deteriorated oral health, and psychosocial problems maintains and strengthens fear. This avoidance often involves a history of irregular dental attendance, and missed and cancelled appointments, sometimes in combination with

increased frequency of emergency dental care (Hakeberg & Lundgren, 2013; Taani, 2002). Deterioration of oral status increases risk of caries, extraction, and missing teeth (Hakeberg, Berggren, Carlsson, & Gröndahl, 1993; Esa, Ong, Humphris, & Freeman, 2014) as well as unmet needs for dental care and pain (Skaret, Berg, Kvale, & Raadal, 2007; Colares, Franca, Ferreira, Amorim Filho, & Oliveira, 2013).

The psychosocial component of the vicious circle involves feelings of shame and inferiority, and reduced self-esteem related to dentistry, which further trigger avoidance of dental care situations (Boman, Lundgren, Berggren, & Carlsson, 2010; Locker, 2003). Dental fear may have a negative effect on a child's oral-health-related quality of life, particularly with regard to social and emotional well-being (Luoto, Lahti, Nevanperä, Tolvanen, & Locker, 2009). Most studies in this field focus on adults. This could be because the consequences of dental phobia appear later in life. Some have highlighted the need for research concerning the time dimension of the vicious circle of dental phobia (Hakeberg & Lundgren, 2013). The proposed successive model to the vicious circle model, which include a time axis, that is the *vicious spiral of dental anxiety* (Hakeberg, 1992) may be particularly valuable for understanding the consequences of dental phobia that begins in childhood and adolescence.

Managing dental phobia in pediatric dentistry

Commonly used methods for helping children manage dental fear or phobia in pediatric dentistry include:

Familiarization, which is often based on the Tell-Show-Do method designed to gradually expose a child or adolescent to dentistry. This technique involves first describing a dental procedure or instrument to the child, then showing the necessary instruments, sometimes trying the instrument (for instance, the child can experience the drill's vibration on the nails or a tooth), and as a last step, performing the dental care. Familiarization and Tell-Show-Do involve a variety of psychological techniques and mechanisms for behavioral change, including desensitization, exposure, behavioral shaping, and reinforcement (Holst, 1988; Koch & Poulsen, 2009; Roberts, Curzon, Koch, & Martens, 2010).

Distraction, which reduces behavioral distress by diverting a young patient's attention away from distressing or painful stimuli during invasive dental procedures. There is strong evidence that distraction can effectively reduce the pain and distress that children and adolescents experience during needle procedures (Uman et al., 2013).

Sedation, pediatric dentists often use orally administered midazolam, 0.4 mg/kg body weight. Midazolam has depressant effects on the central nervous system with rapid onset and causes

anxiolysis, muscle relaxation, and retrograde amnesia while reducing stress and pain perception (Klingberg, 2002).

Nitrous oxide sedation, a common inhalation anesthetic, comprising a mix of 40% nitrous oxide: 60% oxygen inhaled through a nose mask during the dental procedure. It induces anxiolysis, muscle relaxation, and sometimes euphoria. This method often begins with an initial session to familiarize the child with the mask and introducing deep breathing techniques. Nitrous oxide calms the child and increases cooperation with the dental staff (Hallonsten, 1988).

General anesthesia, requires a pre-treatment visit for anesthetic evaluation. On the day of treatment, the patient arrives in an operating room and receives premedication with benzodiazepines, then full anesthesia. The patient also receives local anesthesia when oral surgery or extractions are indicated. After the dentist has performed all necessary dental procedures and administered post-treatment analgesics, the patient is transported to a recovery room and later discharged, the same day.

Due to lack of randomized controlled trials, comparisons of the advantages and disadvantages of general anesthesia with other sedation methods in pediatric dentistry have not been possible (Ashley, Cecs, & Parry, 2015). Furthermore, according to a systematic map of existing systematic reviews in pediatric dentistry, there is insufficient evidence concerning treatment efficacy of behavior management strategies in the delivery of dental care. Thus the effects of behavior management techniques remain uncertain (Mejære et al., 2015).

ASSESSMENT OF DENTAL PHOBIA

Standardized assessment methods are crucial for evaluating new hypotheses and treatments for dental phobia (Öst & Skaret, 2013). The child anxiety and phobia literature recommends a broad battery of assessment techniques. Such a battery should include diagnostic interviews, self-rating scales, clinician observation, and parental-rating scales. Child phobias can be conceptualized in terms of cognitive and emotional, physiological and overt behavioral factors (King, Ollendick, & Murphy, 1997; Silverman & Ollendick, 2005). For differential diagnosis, the child version of the Anxiety Disorders Interview Schedule for DSM-IV is one of most used instruments in youth anxiety research studies. Another instrument for differential diagnosis is the Development and Well-Being Assessment (DAWBA), which is a package of questionnaires, interviews, and rating techniques designed to generate ICD-10 and DSM-IV psychiatric diagnoses. DAWBA has the advantage of being available in many languages, including Swedish. Furthermore, it is available in both face-to-face and online

versions (Goodman, Ford, Richards, Gatward, & Meltzer, 2000). The Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS-PL) is yet another semi-structured diagnostic interview that generates a reliable and valid DSM-based diagnosis (Kaufman, Birmaher, Rao, 1996).

The Child Fear Survey Schedule-Dental Subscale is an example of a self- and parent-rated instrument for measuring children's emotional responses to dentistry. This instrument has been widely used in pediatric dentistry (Klingberg, 1994). The Behavioral Avoidance Test (BAT) is an example of an instrument for measuring overt behaviors that has been developed for adults in dentistry (Haukebo et al., 2008). To our knowledge no child and adolescent versions of the BAT are available for pediatric dentistry. Researchers also suggest conducting a simple psychophysiological assessment during the BAT, for example, heart rate and blood pressure measurements (Öst & Clark, 2013).

The presence of negative thoughts related to dentistry in adults have been assessed using Likert scales (Haukebo et al., 2008) or questionnaires, such as the Dental Belief Scale (Milgrom, Weinstein, & Getz, 1995), which comprises four dimensions: communication, belittlement, lack of control, and trust. Another model explores five dimensions of negative thoughts: uncontrollability, distrust of dentists, unpredictability, dangerousness, and pain (Armfield, 2010). To our knowledge, none of these scales or questionnaires has been adapted for children and used in pediatric dentistry.

Other researchers have suggested using a qualitative interview approach to assess childhood dental anxiety based on a five-area model consisting of situational factors, altered thoughts, feelings, physical symptoms, and behaviors (Morgan et al., 2016).

COGNITIVE BEHAVIORAL THERAPY

Cognitive behavioral therapy (CBT) is a collective name for psychotherapy methods based on cognitive and learning psychology (Öst & Clark, 2013). Clinical cognitive psychology seeks to help the child to identify and challenge his or her negative thoughts through behavioral experimentation. Learning psychology uses principles of classical and operant conditioning by applying exposure and extinction processes to reduce anxiety. CBT reinforces target behaviors (like opening the mouth while sitting in a dental chair) through verbal and physical praise. Moreover, CBT integrates principles of observational learning through participant modeling (the therapist demonstrates the desirable behavior) or film modeling (showing a film in which a child performs desirable behavior, e.g. getting an intraoral injection). Guided by an exposure list, the psychotherapist helps the child master anxiety-evoking situations

gradually. The child learns coping strategies, such as controlled breathing, relaxation, and mindfulness. This combination of mastery, model learning, social persuasion, and coping strategies (aimed to reduce physical stress reactions) together promote the self-efficacy that some researchers postulate to be a mechanism of change in CBT (Gallagher et al., 2013). Perceived self-efficacy is defined as “people’s beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives” (Bandura, 1997). CBT is a structured treatment based on a manual and typically consists of 5 to 20 sessions, depending on the clinical problem. One researcher, however, has developed a single-session format involving one 3-hour treatment (Öst, 1989). The aim of CBT is to enable patients to help themselves and, thus, homework assignments have a central place in the treatment (Öst & Clark, 2013).

Studies show CBT to be an efficacious treatment for specific phobias (Ollendick & King, 1998; Antony & Barlow, 2004; von Knorring et al., 2005; Reuterskiöld, 2009). Öst (2010) conducted systematic review of 12 CBT studies for specific phobias with 630 patients aged 4.5-13.1 years ($M \pm SD = 9.5 \pm 2.8$). Number of treatment sessions varied between 1 and 10 (4.1 ± 7.5), with session length varying between 1.5 and 13.3 hours (4.6 ± 3.9). Effect size compared with the wait-list controls and placebo group was large (Cohen’s $d = 1.8$ and 1.1). Treatment results were according to this study clinically significant for 70% of the patients at the post-treatment assessment and for 76% at follow-up, on average, 8 months after CBT. Randomized trials have found moderate to large treatment effects for adults with dental anxiety (Kvale, Berggren, & Milgrom, 2004; Haukebo et al., 2008; Öst & Clark, 2013). Several CBT manuals for treating children with anxiety problems are available. These are “Coping Cat” (Beidas, Benjamin, Puleo, Edmunds, & Kendall, 2010; Podell, Mychailyszyn, Edmunds, Puleo, & Kendall, 2010), “Cool Kids” (Lyneham, Abbott, & Rapee, 2003; Wuthrich et al., 2012), and “Intensive One-Session Treatment of Specific Phobia” (Öst, 1989). Researchers have highlighted the need for CBT for children and adolescents with dental phobia (Porritt, Marshman, & Rodd, 2012). However, to our knowledge, there have been no published CBT studies in pediatric dental phobia. One study presented an intervention that included three CBT techniques (not a complete CBT program) and was designed for preschool children with strong dental fear. The treatment was 16 minutes long, containing model learning by film, breathing techniques, and positive self-talk. It was delivered in one session by a dentist. Results of that study showed that the CBT techniques used in the study significantly reduced dental fear compared to controls and increased the child’s cooperation with the dentist (Kebriaee et al., 2015).

Access is very limited to qualitative studies that focus on children's and adolescents' experiences of psychological treatments such as CBT and/or dental treatments (Marshman et al., 2007; Svensson, Larsson, & Öst, 2002). The only study we have been able to find on children's and adolescent's experience of CBT for specific phobia shows that participants appreciated visiting a psychologist and were satisfied with the outcome of CBT (Svensson et al., 2002).

INTERNET-BASED COGNITIVE BEHAVIORAL THERAPY

Internet-based cognitive behavioral therapy (ICBT) has the same theoretical foundation as conventional face-to-face CBT, but it is delivered over the Internet. It derives from so-called "bibliotherapy" or self-help books (Gould & Clum, 1993), but in ICBT the self-help book (the "treatment manual") is provided via an internet platform. This platform is secure, meaning that it is encrypted and has a double authentication procedure at login. A message system integrated into the platform provides the patient with continuous and direct contact with a clinician, who guides the patient through treatment (Lindfors & Andersson, 2016). Besides texts, the platform contains short informational films and various questionnaires (assessment or home exercises) that the clinician can review and give feedback to the patient. Despite its newness, more than 100 controlled studies concerning 25 different clinical disorders have evaluated ICBT for adults (Hedman, Ljótsson, & Lindfors, 2012). These studies report medium to large effect sizes. For example, effect sizes for a mixed group of anxiety disorders show a range of 0.76–1.48, as well as an effect size of 1.8 for ICBT treatment of specific phobia (spider phobia). According to a recent meta-analysis the treatment effect of ICBT is comparable to conventional face-to-face CBT (Andersson, Cuijpers, Carlbring, Riper, & Hedman, 2014). There are also studies of computerized CBT (which uses a computer instead of an internet platform) for adults with dental or intraoral injection phobias that have reported reductions in self-reported measures of dental anxiety (Heaton, Leroux, Ruff, & Coldwell, 2013; Tellez et al., 2015). One of the studies reported an effect size of $d = 1.4$. Others have published a protocol describing an upcoming virtual reality exposure therapy to treat dental phobia (Raghav et al., 2016).

Meta-analyses and systematic reviews of computer- or Internet-assisted CBT for childhood anxiety and depression have reported promising results with regard to the efficacy of these interventions (Ebert et al., 2015; Rooksby, Elouafkaoui, Humphris, Clarkson, & Freeman, 2015). Most studies have been conducted in schoolchildren (Lenhard et al., 2014; March, Spence, & Donovan, 2009; Spence et al., 2011; Vigerland, Lenhard, et al., 2016; Vigerland, Ljótsson, et al., 2016). Overall, there are fewer studies on guided ICBT for children available

compared to adult studies. The systematic reviews mentioned above, therefore, include both computerized CBT (cCBT) and Internet-based treatments. The reported overall mean effect size (Hedges' g) of ICBT and cCBT on symptoms of anxiety at post-test was medium to large, $g = 0.68$ (Ebert et al., 2015). Consistency between clinician-, parent-, and child- or adolescent-reported results was low in some studies. A recent randomized controlled trial of ICBT, for instance, showed that guided ICBT for children with anxiety disorders reduced the clinician's severity rating of anxiety symptoms significantly with a large effect size (Cohen's $d = 1.66$). Meanwhile, improvement in parental ratings of anxiety was significant at post-treatment, but effect size was low (Cohen's $d = 0.45$), and child-reported anxiety showed no significant improvement (Vigerland, Ljótsson, et al., 2016).

PARENTAL ROLE

Parents have a central role in CBT and ICBT. The level of parent involvement varies based on the child's age. For instance, in ICBT for 3–6-year-olds with anxiety disorders, treatment content is completely focused on parents, who get access to six sessions and online guidance from a therapist (Donovan & March, 2014). In contrast, the cCBT program “Cool Teens” (for adolescents 14–17 years) only provides parents with a brief handout on the core strategies of CBT and three short telephone calls with the therapist (Wuthrich et al., 2012). The live and clinical versions of “Cool Kids” and “Cool Teens”, however, comprise equal amounts of treatment for the parent and the child or adolescent, ten 2-hour weekly group sessions with children and their parents separately (Lyneham et al., 2003). A recently conducted ICBT study for children aged 8–12 with anxiety disorders was mainly a combined parent-child intervention with seven of the modules focusing on the parent(s) while four addressed the child (Vigerland, Ljótsson, et al., 2016). The contents of these programs are similar to each other and comprise the core principals of CBT in greater or lesser detail, such as psycho-education, goal setting, exposure, home assignments, use of a reward system, coping strategies, problem solving, and a maintenance plan. Additionally, parents learn how to reduce their urge to control and overprotect and also sometimes learn strategies to manage their own anxiety related to the child and his or her behavior.

SUMMARY

Dental phobia is a persistent, intense and maladaptive fear of specific objects or procedures in dentistry. The vicious circle of dental anxiety in the dental literature illustrates the consequences of dental phobia and highlights avoidance, deteriorated oral health, and psychosocial problems, including how these maintain and strengthen fear over time. With the help of the various behavioral management strategies used in pediatric dentistry, children and adolescents can receive necessary dental care. It is, however, uncertain whether these strategies are capable of breaking the vicious circle of dental anxiety during childhood, and leading to sustainable behavioral, cognitive, and affective change. There is need for evidence-based methods for treating pediatric dental phobia. CBT is an evidence-based psychological treatment for specific phobias. To our knowledge no other study of CBT for pediatric phobia has been published.

ICBT is a new version of CBT that is more accessible than face-to-face CBT. Existing research shows that ICBT has similar effects to CBT for treating many psychiatric disorders for children, adolescents, and adults. To our knowledge, no study of ICBT for pediatric dental phobia has previously been published.

GENERAL AIMS

The general aim of this thesis was to develop and scientifically evaluate two forms of CBT, face-to-face CBT and Internet-based CBT, for pediatric dental phobia.

Specific aims were:

- To explore how school-aged children and adolescents, and their parents, experience and benefit from CBT for dental phobia
- To test the hypothesis that CBT is more efficacious than treatment as usual for increasing school-aged children's ability to undergo dental procedures and reducing dental anxiety.
- To test *(i)* the hypothesis that psychologist-guided ICBT improves school-aged children's and adolescents' ability to manage dental phobia and *(ii)* the feasibility and acceptability of this novel treatment.

EMPIRICAL STUDIES

STUDY I: CHILDREN AND PARENTS' EXPERIENCES OF COGNITIVE BEHAVIORAL THERAPY FOR DENTAL ANXIETY - A QUALITATIVE STUDY

AIM

To explore how school-aged children and adolescents, and their parents, experience and benefit from CBT for dental phobia.

PATICIPANTS AND METHODS

Design: This study had a qualitative interview design.

Recruitment and participants: The participant sample consisted of children and adolescents referred to specialist pediatric dentistry (for dental phobia) and treated with face to face individual CBT. To be eligible for inclusion, participants had to meet the following criteria: The participant (a) had been treated with CBT for dental phobia between November 2010 and October 2012, (b) had received at least four sessions of treatment delivered by a psychologist, and (c) was 7–19 years old at the time of treatment. Of the 17 participants fulfilling the eligibility criteria, 12 were possible to reach by telephone. They agreed, together with their parents, to participate in the study, and we included them. The children and adolescents were five males and seven females with a mean age of 13 ± 4 years (range: 9–19) at the time of the interview. Intraoral injection was the main object of fear for 10 of 12 participants.

Interviews: Parents and children were interviewed over the telephone for 30 minutes according to an interview guide containing questions about experiences, feelings, thoughts, and memories related to CBT and its outcome.

Data analyses: Study I used thematic analysis, a qualitative analysis method, to identify themes and patterns in the interviews. Theme was defined as a meaningful structure that captures an important insight in relation to the research question. Thematic analysis has six stages: (1) familiarization with the data, in which we transcribed interviews and two psychologists and two dental students read the transcripts separately, (2) code generation, which coded important features of the data, (3) searching for themes, in which we proposed potential themes, (4) reviewing themes, which involved discussing and refining the codes and themes, (5) defining and naming, which required defining themes and their 'essence' to create a coherent structure and define internal relationships between themes, and (6) producing the report, which involved drafting and revising the report several times.

RESULTS

Perspective shift emerged as an overarching theme. It described how CBT helped children and adolescents change their view of dentistry and discover their own potentials and capabilities. Figure 1 shows the result of the thematic analyses in Study I. We identified three main themes:

(a) *Mastery*, which described how CBT helped participants successfully undergo challenging procedures in dentistry, sometimes despite fear. The analyses showed that gradual exposure and experience of autonomy and control were sources of mastery.

(b) *Feelings of safety in a dental context*, which were achieved through changed appraisal, describing how participants found the potential benefits of dentistry to be larger than the potential threats (risk for harm). Feelings of safety were also a consequence of the therapeutic alliance and positive feelings toward the psychologist and the dental team.

(c) *Reduced fear*, which was achieved through various behavioral and cognitive coping strategies that the participant learned. Participants particularly highlighted breathing techniques as an important strategy. The analyses also suggested that decreased emotional and physical distress and arousal before the dental visit, so-called “anticipatory anxiety”, was important in reducing fear.

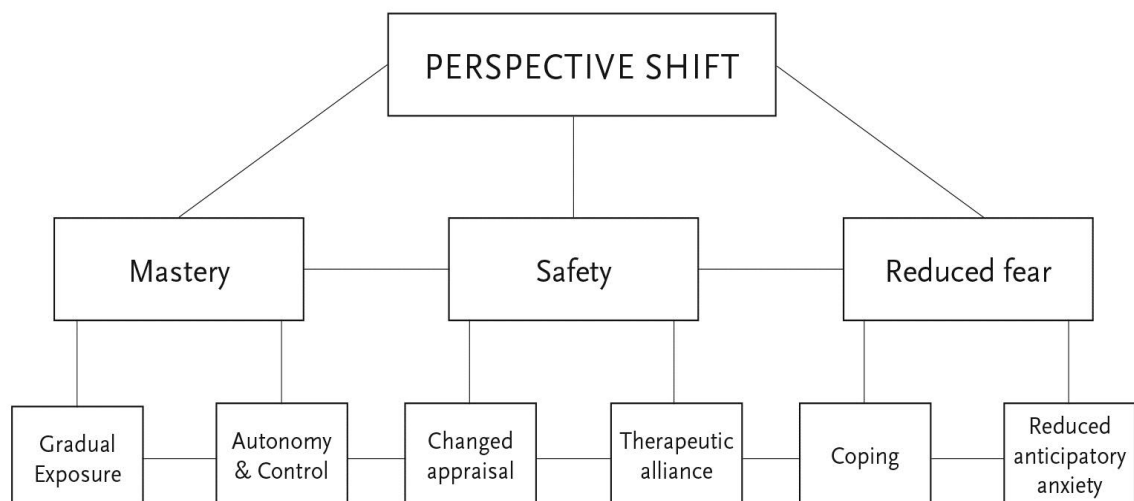


Figure 1. Thematic map.

STUDY II: COGNITIVE BEHAVIORAL THERAPY FOR CHILDREN WITH DENTAL ANXIETY: A RANDOMIZED CONTROLLED TRIAL

AIM

To test the hypothesis that CBT is more efficacious than treatment as usual for increasing school-aged children's ability to undergo dental procedures and reducing dental anxiety.

PARTICIPANTS AND METHODS

Design: This study was a parallel-group randomized controlled trial. The clinical trial was conducted at two pediatric dental clinics in Stockholm. The outcome assessors (for the primary outcome) were blind to the assigned treatment. Participants were randomly assigned to Treatment as usual ($n = 17$) or CBT ($n = 13$). We conducted assessments at baseline, 3 months after treatment began, and at a 1-year follow-up.

Recruitment and participants: The participants ($N = 30$) were 7–19 years old. Main eligibility criteria for participation were (a) the patient and all primary caregivers agreed to participate in the research project, (b) the patient had a diagnosis of specific phobia according to DSM-IV (dental anxiety or intraoral needle phobia) as established by a psychologist, (c) the patient had no other psychiatric disorder considered to be the primary diagnosis, and (d) the patient was not receiving concurrent psychological treatments and did not have appointments booked for psychological examination elsewhere.

Outcome measures: The primary outcome measure was the BAT. The secondary outcome measure was the presence of dental phobia as measured in a structured clinical interview for dental anxiety. The interview format was based on the specific phobia section of the Development and Well-Being Assessment (Goodman et al., 2000) with additional questions related to dentistry. The other outcome measures were the parent and child versions of the Children's Fear Survey Schedule - Dental Subscale (Klingberg, 1994) and the Self-Efficacy Questionnaire for Specific Phobias (Flatt & King, 2009).

Interventions: Our research team developed a therapist treatment manual based on the CBT models outlined in the introduction of this thesis, but adapted to pediatric dentistry (appendix 1). It consisted of 10 therapeutic sessions (each 1 hour long). The main components of treatment were behavioral analyses, psychoeducation, parent education, exposure to dental procedures both in vivo and with films, relaxation techniques, procedural pain management information, cognitive restructuring, and home assignments. The film scenes were based on the principles of model learning and promoted processes that facilitate development of self-

efficacy (Bandura, 1997; Melamed, Yurcheson, Fleece, Hutcherson, & Hawes, 1978). From Module 6 onward, a dentist and/or a dental assistant administered exposure during dental visits concurrent with psychologist visits. The number of dental visits varied depending on the patient's treatment needs. The therapists conducting the treatment were three licensed psychologists. The control condition consisted of methods usually applied in pediatric dentistry. These methods were Tell-Show-Do, sedation with midazolam, nitrous oxide sedation, or general anesthesia. Specialists or post-graduate students in pediatric dentistry provided these treatments with the help of dental assistants.

Statistical analyses: Repeated measure ANOVA and t-tests analyzed the results of between- and within-group differences regarding continuous outcome measures. For dichotomous variables we used the chi-square test, Fisher's exact test, Cochran's Q, and McNemar's test to explore between- and within-group differences. We evaluated clinically significant improvement on the basis of the BAT. Cohen's d based on pooled standard deviations determined effect sizes.

RESULTS

Attrition: Of the 13 participants in the CBT group, 11 completed the post and the 1-year follow-up assessments. Of the 17 participants in the Treatment as usual group, 16 completed the post and the 1-year follow-up assessments (applies the primary outcome measure).

Efficacy of CBT compared to treatment as usual: We observed a statistically significant interaction of group and time for the primary outcome measure (BAT) [$F(2,50) = 5.78, p = .006$, partial $\eta^2 = 0.19$]. Children and adolescents in the CBT group managed a significantly greater number of dental care situations at post-treatment and at the 1-year follow-up ($15.2 \pm 4.1, 16.8 \pm 2.4$) compared to the Treatment as usual group ($11.1 \pm 2.1, 11.4 \pm 3.1$). Within-group analyses showed improvements for both groups from baseline to post-treatment and from baseline to the 1-year follow-up. Changes from post-treatment to the 1-year follow-up were non-significant. Significant reduction occurred over time in the proportion of participants fulfilling the criteria for dental phobia. There was also a significant between-group difference in favor of CBT concerning proportion of participants not meeting the diagnostic criteria for dental phobia. After treatment, 64% of the CBT group no longer met the diagnostic criteria for dental phobia compared to 18% of controls. Corresponding changes at the 1-year-follow-up were 91% and 25%. Analyses of the interaction between the intervention and time in the CFSS-DS-C, CFSS-DS-P, and SEQ-SP showed no significant interaction. However, we observed significant between-group differences favoring CBT

(reduction of fear and increased self-efficacy) at both the post-treatment assessment and the 1-year follow-up for all three measures.

Effect sizes: Large CBT effect sizes occurred for all continuous outcome measures in between-group analyses (range of 1.4–2.2, Table1). Within-group effect sizes showed improvements between baseline and post-treatment and between baseline and the 1-year follow-up for both groups. In general, the effect sizes for the CBT group were much larger compared to the Treatment as usual group. Differences in improvement for the CBT group compared to controls were extensive with regard to self-efficacy (Table 1). Our analyses showed that improvements in the CBT group were clinically significant, with 64% of CBT participants managing all stages of the BAT at post-treatment compared to 6% in the controls. Corresponding frequencies at the 1-year follow-up were 73% and 13%. We found significant improvement in favor of CBT at both the post-treatment assessment ($p = 0.002$) and the 1-year follow-up ($p = 0.003$). No adverse events were reported.

Table 1. CBT-phobia. Effect sizes on primary and secondary outcome measures

Measures	Between-group effect sizes		Within-group effect sizes	
	After treatment	1-year follow-up	Before treatment to after treatment	Before treatment to 1-year follow-up
BAT	1.4 (0.5–2.3)****	1.9 (0.95–2.9)***		
CBT	N=11	N=11	2.0 (1.7–2.9)****	2.9 (0.8–5.0)****
TAU	N=17	N=16	1.3 (0.3–2.3)**	1.2 (0.4–2.0)***
CFSS-DS-C	1.4 (0.5–2.3)*	1.0 (0.2–1.9)***		
CBT	N=11	N=11	1.8 (0.9–2.8)****	1.3 (0.3–2.3)***
TAU	N=16	N=16	0.9 (0.2–1.7)**	1.0 (0.2–1.7)**
CFSS-DS-P	1.7 (0.7–2.7)****	1.5 (0.6–2.5)***		
CBT	N=11	N=11	1.8 (0.7–3.0)****	2.2 (1.1–3.3)****
TAU	N=15	N=15	0.8 (0.3–1.3)***	1.3 (0.3–2.3)***
Self-Efficacy	2.2 (1.1–3.3)***	1.7 (0.7–2.6)***		
CBT	N=10	N=10	1.9 (1.3–2.5)****	1.6 (0.2–3.1)**
TAU	N=15	N=16	0.3 (-0.4–0.9)	0.3 (-0.4–1.1)

According to the paired t-test: * $p < 0.05$; ** $p \leq 0.01$; *** $p < 0.001$; **** $p < 0.0001$. BAT = Behavioral avoidance test; CFSS-DS-C = Child Fear Survey Schedule- Dental Subscale-child version; CFSS-DS-P = Child Fear Survey Schedule- Dental Subscale-parent version; CBT = cognitive behavioral therapy; TAU = treatment as usual.

Information from dental records indicates that all necessary dental treatment needs for participants were met in both intervention groups. In the CBT group, one participant required adjunctive midazolam sedation because of a difficult extraction (lingually inclined 35). In the Treatment as usual group, 50% of participants were treated using nitrous oxide, midazolam, or general anesthesia.

STUDY III: INTERNET-BASED COGNITIVE BEHAVIORAL THERAPY FOR CHILDREN AND ADOLESCENTS WITH DENTAL ANXIETY - AN OPEN TRIAL

AIMS

To test *(i)* the hypothesis that psychologist-guided ICBT improves school-aged children's and adolescents' ability to manage dental phobia and *(ii)* the feasibility and acceptability of this novel treatment.

PARTICIPANTS AND METHODS

Design: The study had a single-group, open-trial design. We conducted assessments at baseline, at post-treatment, and at the 1-year follow-up.

Participants and recruitment: Participants ($n = 18$) were 8–15 years old (11 ± 2), 11 girls and 7 boys. Of these, 78% of participants indicated that injection was one of the main sources of their fear in dentistry. Main eligibility criteria for participation were (a) the patient and all primary caregivers agreed to participate in the research project, (b) a diagnosis of specific phobia (dental anxiety or intraoral needle phobia) had been established by a psychologist according to the DSM-IV, (c) the patient had no neurodevelopmental disorder, (d) the patient had no other psychiatric disorders considered to be the primary diagnosis, (e) there was no current/planned psychological examination or treatment, (f) if the child suffered from injection phobia, the parents agreed that the child would receive intraoral injection at the dentist, even if the child did not need dental treatment, and (g) the participant and parents had sufficient language skills in Swedish to manage the treatment and questionnaires.

Outcome measures: The primary outcome measure was the Picture-Guided Behavioral Avoidance Test (PG-BAT). The secondary outcome measure was the presence or absence of dental phobia as measured by the specific phobia part of the Schedule for Affective Disorders and Schizophrenia for School-Age Children. The other outcome measures were the Children's Fear Survey Schedule - Dental Subscale (Klingberg 1994), both the child and parent versions, the Self-Efficacy Questionnaire for Specific Phobias (Flatt and King 2009),

Parental Self-Efficacy Scale for Dental Anxiety, Children's Negative Cognitions in Dentistry and the Injection Phobia Scale for Children (Wahlund, 2008; Öst, Hellström, & Kåver, 1992).

Intervention: We developed a treatment manual comprising 12 modules of guiding text (appendix 2), worksheets, and informational documents. Participants accessed the treatment modules through a specially designed patient-secure platform for Internet-based psychological treatments. A psychologist with formal CBT competence guided the participants and their coaches during the 12 weeks of treatment via a messaging system on the Internet platform. Treatment was a combined coach-patient intervention with 2 modules focusing on the coach (usually a parent) and 10 addressing the child or adolescent (the patient) directly. The central components of the modules were parent education, behavioral analyses, psychoeducation, pain education, exposure, relaxation, mindfulness and breathing techniques, cognitive restructuring, and relapse prevention.



Figure 2. Screenshot of the components of the Internet-based treatment.

Exposure exercises used dentistry-related films and sound files and also dental tools – such as a dentist's mirror, dental probe, topical anesthetic, and needle, which we sent home to the coach. The modules included detailed instructions on how to use the tools. Film scenes followed the principles of model learning and promoted processes that facilitate development of self-efficacy. Figure 2 shows the main components of ICBT. The film scenes were manuscript-based and aimed to both provide exposure opportunities and the possibility for the participant to build self-efficacy through observational learning. From Module 6 onward, a dentist, a dental hygienist, or dental assistant offered training/treatment and exposure at the

dental clinic alongside ICBT and psychologist guidance online. Participants received a diploma at the end of the treatment.

RESULTS

Attrition and dropout: Of the 18 participants and their parents, 16 completed the post-treatment assessment and 15 completed the measurements at the 1-year follow-up.

Clinician support and adherence: The average total clinician time per participant was 5.4 ± 2.3 hours. Children and their coaches performed on average 9.2 ± 3.3 of the 12 treatment modules.

Efficacy of ICBT: We found significant improvements in children's self-perceived ability to manage dental care and procedures according to the PG-BAT ($F[2, 28]=14.1, p < 0.001$). The parents' assessments agreed with the children's evaluations ($F[2, 28]=21.4, p < 0.001$). Improvements from baseline to post-treatment and from baseline to the 1-year follow-up were significant (Table 2). There was also a significant reduction in the proportion of participants who fulfilled the criteria for dental phobia over time. At the 1-year follow-up, 53% no longer met the diagnostic criteria for dental phobia. There were significant improvements in the level of fear, child and parental self-efficacy, children's negative cognitions in dentistry and general injection phobia, e.g., vaccination (Table 2). There was a significant within-group improvement from baseline to post-treatment and from baseline to the 1-year follow-up for all continuous outcome measures except for the injection phobia scale, where the changes from baseline to the 1-year follow-up were non-significant.

Effect sizes: We observed large within-group effect sizes (Cohen's d range = 0.9–2.2) from baseline to the post-treatment measurements and from baseline to the 1-year follow-up for both the primary measurement (PG-BAT) and other continuous measurements, with the exception of the IPSC (effect size=0.6) from baseline to 1-year follow-up (Table 2). The results were clinically significant and, at the 1-year follow-up, 60% of parents reported that their child had managed intraoral injection at the dental clinic.

Acceptability and adverse effects: The participants and their parents reported a high degree of satisfaction with the treatment (3.3 ± 0.6 for participants and 3.1 ± 0.4 for parents on a scale of 0–4). Some participants, however, requested shorter texts in the modules.

According to the parents, dental professionals were positive to the new treatment (ICBT) and followed the CBT instructions and guidelines designed for dental staff and given them by the parents. All participants were able to train according to the treatment manual at the dental

clinics. In two cases, however, the coaches/parents reported that the dental professionals did not understand the importance of exposure and were avoiding challenges, rather than helping the participant to challenge the fear. No adverse effects were reported.

Table 2. Efficacy of ICBT for children and adolescents with dental phobia.

Measures	Pre	Post	FU	<i>P</i>		Effect sizes	
	(M±SD)	(M±SD)	(M±SD)	<i>t</i> -values		(CI 95%)	
	(N = 16)	(N = 16)	(N = 15)	Pre-post	Pre-FU	Pre-post	Pre-FU
PG-BAT-C	10.5±1.0	13.9±2.9	13.7±2.8	$p < 0.001$	$p = 0.001$	1.5	1.4
				5.5	4.1	(0.7–2.3)	(0.3–2.6)
PG-BAT-P	9.3±2.8	13.7±3	13.7±2.9	$p < 0.001$	$p < 0.001$	1.5	1.6
				4.9	4.8	(0.6–2.5)	(0.5–2.6)
CFSS-DS-C	32.9±10.2	24.1±6.8	23.8±6.4	$p < 0.001$	$p = 0.006$	1.0	1.1
				6.3	3.2	(0.5–1.6)	(0.2–1.9)
CFSS-DS-P	35.4±10.1	24.1±6.3	25.0±4.8	$p < 0.001$	$p = 0.001$	1.3	1.3
				5.69	4.5	(0.7–2.0)	(0.6–2.0)
SEQ-SP-C	27.8±8.3	44.6±6.9	44.1±11.1	$p < 0.001$	$p = 0.001$	2.2	1.66
				6.22	4.3	(0.8–3.6)	(0.4–2.9)
P-SEQ-DA	107.9±13.3	124.7±7.2	118.7±11.6	$p < 0.001$	$p = 0.02$	1.6	0.9
				6.50	2.6	(0.9–2.2)	(0.0–1.7)
CNCD	24.0±12.6	8.0±9.0	11.4±10.1	$p < 0.001$	$p < 0.001$	1.7	1.1
				5.4	4.8	(0.6–2.9)	(0.5–1.8)
IPSC	44.4±14.3	33.3±10.9	35.9±12.1	$p < 0.01$	$p = 0.08$	0.9	0.6
				4.05	1.9	(0.4–1.39)	(-.05–1.3)

PG-BAT-C = picture-guided behavior avoidance test, child version; PG-BAT-P = picture-guided behavior avoidance test, parental version; CFSS-DS-C = child fear survey schedule–dental subscale, child version; CFSS-DS-P = child fear survey schedule–dental subscale, parental version; SEQ-SP = self-efficacy questionnaire for specific phobias; P-SEQ-DA = parental self-efficacy questionnaire for dental anxiety; CNCD = children's negative cognitions in dentistry; IPSC = injection phobia scale for children; Pre = baseline measurement; Post = post-treatment measurement (after 12 weeks of treatment); FU = 1-year-follow up (1 year after post-treatment).

SUMMARY TABLES AND FIGURES STUDY II & STUDY III

Studies I and II differ from each other in several ways, e.g., differing age ranges of participants, different versions of the primary outcome measures (BAT; clinician assessed in study II and child assessed in study III) and different access to treatment at general or pediatric specialist dental clinics, etc. Despite these differences it could be interesting to conduct a descriptive comparison between Treatment as usual, CBT and ICBT. Table 3 shows several similarities between these three groups concerning gender, age, duration of fear and strong presence of intraoral injection as main fear.

Table 3. Baseline demographic and clinical characteristics from Study II and III

Variables	CBT (n=13)	ICBT (n=18)	TAU (n=17)
Age, years ($\bar{x}\pm SD$)	10 \pm 3	11 \pm 2	10 \pm 3
Gender (girls %)	70	61	76
Parental or sibling dental fear (%)	31	6	30
Comorbidity (%)	8	30	12
Duration of dental anxiety, years ($\bar{x}\pm SD$)	4 \pm 3.9	4 \pm 3.0	3.6 \pm 2.9
Intraoral injection as main fear (%)	76	78	71
Referred to pediatric dental clinic (%)	100	100	44

CBT= Cognitive behavioral therapy, ICBT=Internet-based CBT, TAU=Treatment as usual

Comparisons between Treatments as usual, CBT and ICBT in figure 3 show that ICBT-group perceived (assessed by themselves) that they manage several procedures in dentistry compared to participants in Treatment as usual group and CBT (assessed by dentist) at the baseline (Figure 3). All three groups improved over time. However, Treatment as usual group did not manage to pass the clinical significance level of the BAT test (item 12, e.g., accepting injection).

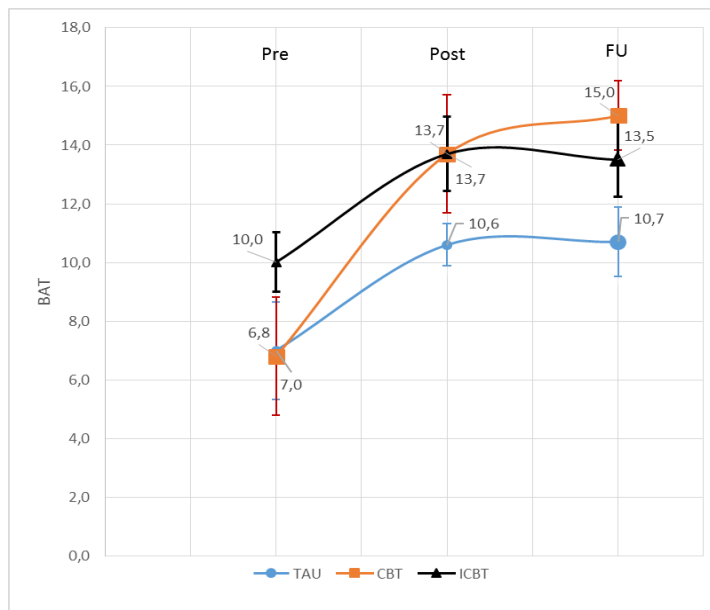


Figure 3. Improvement over time on Behavior Avoidance Test (BAT) in Studies II and III. Pre=baseline assessment, Post= post-treatment assessment and FU= 1-year-follow-up
Note: To be able to compare these tests, two items from BAT and one item from PG-BAT has been removed. The numbers in the figure show average values at different measurement occasions and error bars show 95% confidence interval for the mean.

CBT group showed the highest level of self-efficacy improvement and Treatment as usual group showed the lowest improvement level according to the descriptive data presented in figure 4.

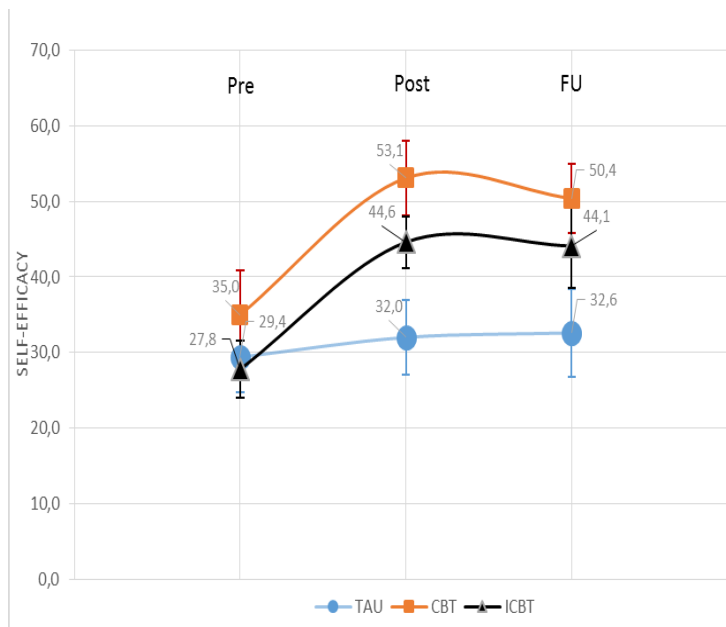


Figure 4. Results of the Self-Efficacy Questionnaire for Phobic situations in Study II & III. Note: The numbers in the figure show average values at different measurement occasions and error bars show 95% confidence interval for the mean.

ICBT group showed the least level of dental fear according to mean values of CFSS-DS at the baseline assessment (Figure 5). All three groups improved and reduced their level of fear. CBT and ICBT showed the lowest level of fear at the post and 1-year-follow-up.

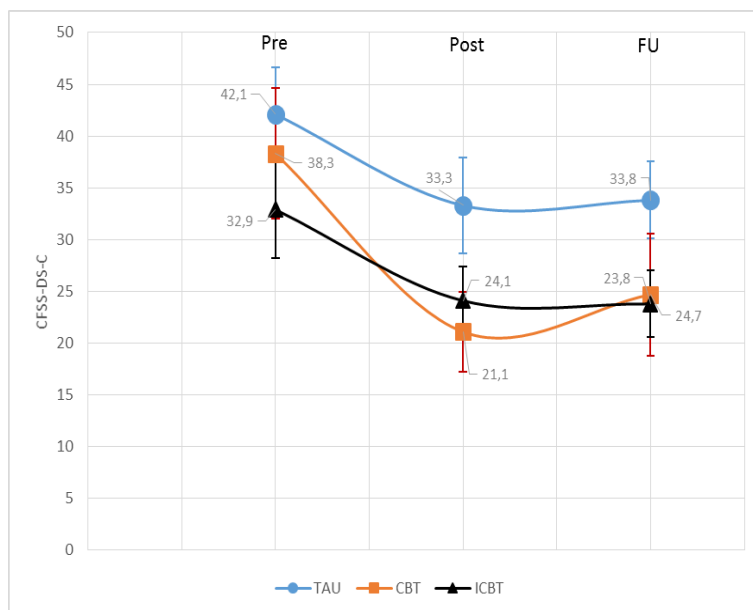


Figure 5. Results of the CFSS-DS-C= Child fear survey schedule- child version, Study II & III. Pre=baseline assessment, Post= post-treatment assessment and FU= 1-year-follow-up
Note: The numbers in the figure show average values at different measurement occasions and error bars show 95% confidence interval for the mean.

The percentage of patients that did not fulfill the criteria for dental phobia according to DSM IV over time were 91% in the CBT-group, 53% in ICBT-group and 25% in the Treatment as usual group.

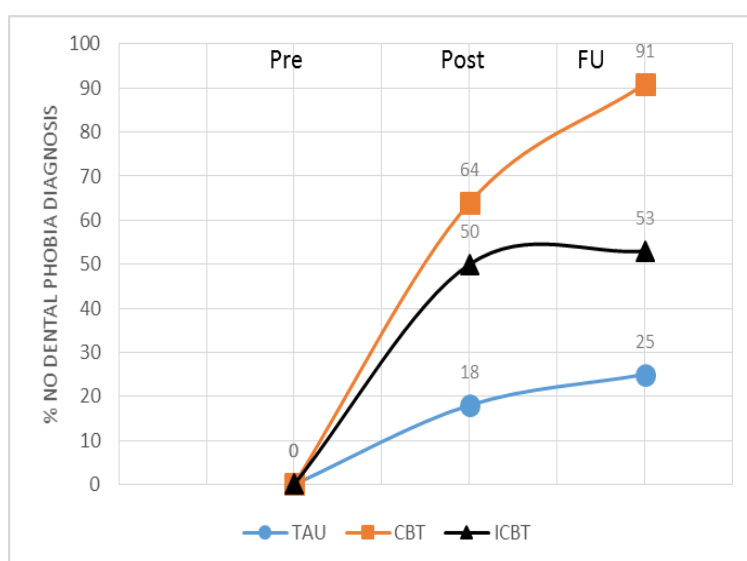


Figure 6. Improvements regarding diagnostic status over time. Pre=baseline assessment, Post= post-treatment assessment and FU= 1-year-follow-up

GENERAL DISCUSSION

This thesis includes three studies. Study I mapped the important aspects of CBT in the context of pediatric dentistry from the perspective of parents and children. Based on Study I and existing CBT literature, we developed a treatment manual to investigate the efficacy of CBT for pediatric dental phobia (Study II). This second study showed that CBT for pediatric dental phobia was significantly more effective in reducing dental phobia than treatment as usual and effect sizes were large. We therefore concluded that CBT can be an effective treatment of potentially high value for children with dental phobia. However, we were aware that currently there are limited prospects for children and adolescents to access CBT in dentistry. Thus, we also developed an Internet-based CBT program for children, easy for children and parents to access, without the need for referrals to specialist pediatric clinics. The main finding from this study (Study III) was that Internet-based CBT is a feasible treatment yielding promising effects. Below we discuss the main findings, methodological considerations, and clinical implications of these studies.

EFFICACY OF CBT FOR PEDIATRIC DENTAL PHOBIA

Results from our three studies are concordant and suggest that CBT is an efficacious treatment for school children and adolescents with dental phobia. Study I showed that children with dental phobia experienced mastery, feelings of safety, and reduced fear when they received CBT. Study II showed that participants receiving CBT increased their ability to manage dental procedures and self-efficacy and showed less dental anxiety compared to participants in the Treatment as usual group. Moreover, a significant proportion of the participants were free of a dental phobia diagnosis after treatment.

Significant improvements and large effect sizes for the controls showed that treatment as usual did function as an active control group, which was our intention. However, we still observed larger between-group effect sizes in the CBT group, range 1.4–2.2 (Cohen's d) at the post-treatment assessment. The randomized controlled trial (RCT) design in Study II suggests that the new treatments were responsible for these improvements. Large effect sizes (within-group) for ICBT in Study III (Cohen's $d = 0.9$ –2.2) could suggest that CBT is effective even without face-to-face psychologist contacts and without involving staff at specialist pediatric dental clinics; children and adolescents who participated in the study lived in different parts of the country and visited various general and specialist dental clinics.

Taken together with results from RCT studies of CBT for other pediatric-specific phobias (Ollendick & King, 1998; Antony & Barlow, 2004; von Knorring et al., 2005; Reuterskiöld, 2009; Öst, 2010) and from systematic reviews of CBT treatment for adults with dental phobia (Kvale, Berggren, & Milgrom, 2004; Öst & Kvale, 2013), the evidence for face-to-face CBT to treat pediatric dental phobia is strong enough to recommend that the treatment become routine in pediatric dentistry. The treatment, of course, needs further testing in clinical trials, but the large observed effects, the absence of a gold-standard treatment, and the low risk of CBT in terms of adverse events present a strong case for its implementation. Despite the limitations of the various CBT studies for children and adolescents in the literature, the treatment tested in the present study still has the best empirical support of any treatment for dental phobia in children.

Mechanism of change

Like its predecessor (Beidas et al., 2010; Davis, Ollendick, & Öst, 2012; Lyneham et al., 2003), the CBT manual we designed consisted of a wide range of behavioral, affective, and cognitive therapeutic tools. This makes it difficult to pinpoint the exact mechanisms of change in the treatment. However, our studies give some support to the hypothesis that dentistry-specific self-efficacy associates with the mechanism of therapeutic change in CBT (Gallagher et al., 2013). This was most evident in Study II, where participants in both the control and intervention groups improved in outcome measures evaluating level of fear and ability to manage dental procedures, but only the intervention group improved in self-efficacy (effect size = 1.9 at post-treatment assessment), with clinically significant results.

Furthermore, in Study III, self-efficacy improvements showed the highest effect size. This led us to conclude that ICBT is a promising treatment with effect perhaps partially mediated by self-efficacy.

The self-efficacy effect we found could relate to the film exposures included in both face-to-face therapy and ICBT. These film scenes were manuscript-based and built on the principles of model learning that promote processes that facilitate the development of self-efficacy (Bandura, 1977). Studies have also shown that vicarious exposure and film modeling can be as effective or even more effective than live exposure when dealing with fear stimuli (Golkar, Selbing, Flygare, Ohman, & Olsson, 2013; Melamed et al., 1978).

Support for self-efficacy as a mechanism of change was not clear in Study I, which was a particularly appropriate study for gaining information about the potential mechanisms of change. However, in terms of perspective shift, the overarching theme in the study, we found

CBT-related shifting of views in children and adolescents concerning their own potential and capacity to deal with challenging situations in dentistry, and this corresponds with self-efficacy. Specially designed trials are necessary to determine whether self-efficacy is a mechanism of change.

Effectiveness

Treatment effectiveness is the degree to which a treatment is feasible and can produce strong effects in a real clinical situation (Flay et al., 2005). All our studies were conducted in a real-world clinical setting. This was possible since the main study site, the Division of Pediatric Dentistry at Karolinska Institutet, is both an academic facility and a specialist clinic for pediatric dentistry. Part of Study II took place at Eastmaninstitutet, which is also a clinical facility for specialist pediatric dental care. All psychologists and dentists in the study worked at specialist pediatric dentistry clinics. Our studies indicate that CBT for dental phobia is an effective treatment and feasible in a clinical situation, given a psychotherapeutic infrastructure providing access to a psychologist with CBT competence and room for psychotherapeutic activity in the pediatric dental setting. One of the most challenging parts of the treatment program in Study II was coordinating visit times that suited everybody (children, parents, psychologists, and dentists).

ICBT in Study III was delivered by clinical psychologists employed at specialist pediatric dentistry clinics. Training, behavioral experimentation, and dental treatment then occurred at general and specialist dental clinics.

The research procedures placed limitations on effectiveness in Studies II and III by imposing strict inclusion criteria, extensive assessment procedures, and randomization (Study II only). These procedures are not so common in clinical reality. Therefore, Study I was valuable for examining CBT in the context of regular care, not subjected to control procedures prior to the evaluation. Study I was also particularly valuable because, through qualitative interviews, it captured the perspectives of both the children and parents concerning the treatment, which is unusual in pediatric dental research (Marshman et al., 2007).

METHODOLOGICAL CONSIDERATIONS

Ethical reflections

When planning our studies, CBT for specific phobias already had strong and sufficient scientific evidence of efficacy and effectiveness for treating both children and adults. We had to decide whether it was necessary to conduct CBT studies for pediatric dental phobia, which

is a form of specific phobia. We reasoned that, because CBT had not been tested scientifically in pediatric dentistry, it was unknown whether the treatment produced any benefits beyond treatment as usual methods. We also noted that, if CBT was not tested scientifically in pediatric dentistry, the probability that CBT would become accessible for children and adolescents in dentistry would be low. We concluded that the benefits of testing CBT for pediatric dental phobia (and its potential to reduce suffering and fear and improve the quality of life) was larger than the risk of an unnecessary trial for a proven method. ICBT research in this thesis was greatly motivated by its capacity to promote and strengthen fairness through equal accessibility to health care. Children have limited access to the treatment compared to adults. This is particularly important given the UN Convention on the Rights of the Child, which stresses the “best interest of the child” in Article 3 (UN, 2016). In this case, this should be interpreted as providing access to the best evidence-based psychological treatment, even for children in dentistry. This convention will be adapted into Swedish law and is already a cornerstone of Swedish pediatric dentistry (Klingberg et al., 2010).

Evaluating ICBT is a young field of research that raises new ethical issues. A recurring question is: What are the consequences of online contacts without face-to-face encounters? For instance, the philosopher of ethics, Emmanuel Levinas, postulated that ethics arise from the perception of the other's face, which triggers a sense of responsibility. In the context of internet treatments, however, research shows that face-to-face contact is not associated with negative treatment effects and that ICBT and face-to-face CBT produce equivalent overall effects (Andersson et al., 2014). ICBT may, in fact, lead to better treatment adherence and increased responsibility for continued treatment and completing homework (Lindfors & Andersson, 2016). In ICBT for children, coaches receive education that enables them to take responsibility for the treatment and guide the children and adolescents.

The engagement of parents and their capacity to take responsibility and support their children through the treatment is a central issue in ICBT, particularly for younger children. A comprehensive evaluation and assessment procedure that determines the capacity of the parents to act as coaches and guide the participant is, therefore, an important part of ICBT, one which is ethically necessary to conduct even when ICBT is implemented as a routine clinical treatment.

The risk for the therapist to have an insufficient sense of responsibility due to the lack of face-to-face contact is both serious and preventable. We overcame this risk in our study by supervision, professional knowledge, and treatment routines similar to those of face-to-face treatment. One ethical issue related to these concerns is the effect on the therapeutic

relationship of missing face-to face contact. Existing research shows, however, that patient ratings of the therapeutic alliance in ICBT are as high as for face-to-face treatment (Lindfors & Andersson, 2016; Sucala et al., 2012).

Children and parents had access to an exercise package with dental tools and materials such as a probe, cotton rolls, topical anesthetic, a spiral-shaped suction nozzle, and a needle for practicing at home. This raised ethical and safety issues, particularly concerning sending home needles for practice, which we discussed extensively with several dentists, physicians, psychiatrists, and psychologists. We came to the conclusion that, if participants had a strong fear of needles (which the majority of our patients had), then they would need to have access to the object of fear to be able to overcome the phobia. As with children suffering from disorders such as diabetes, parents and children can be educated and instructed to handle needles and instruments safely. For the ICBT study, in which it was not possible to instruct the patients and parents at the clinic, we developed extensive written instructions with images that informed the parents and children about how to use the tools and the safety issues. One safety measure we took was to wait to send the exercise package to the coaches until the fourth week of treatment, when the coach had completed the education modules and the children and adolescents had begun their treatment.

Another ethical issue we discussed intensively was the implications of conducting behavioral avoidance tests. We discussed with a group of psychologists and dentists involved in the project whether it would be ethical and safe to expose children to the procedures included in the BAT, which is an assessment performed independent of the children's dental care needs. We decided that the procedure is safe in terms of not damaging any teeth or causing physical harm. Concerning the psychological risk of exposure to too intense levels of anxiety, we concluded that the risk was low since the children could decline any task at any moment without being pressured by adults to perform the task.

The Regional Ethics Committee in Stockholm approved all studies in this thesis. Informational material was available in child/adolescent versions and adult versions. Children/adolescents and both parents (one parent if there was only one primary caregiver) signed informed-consent forms or provided their consent online.

Diagnostic challenges

Diagnostic issues are a challenge in the field of dental phobia. Dental literature uses the concepts of dental fear, dental anxiety, and dental phobia interchangeably (Klingberg & Broberg, 2007). Assessment of these conditions is often based on results of self- or parent-

reported questionnaires, such as the CFSS-DS. The items in these questionnaires are not compatible with the criteria for diagnosis of specific phobia according to the DSM-5 or the ICD-10, which defines the international standard for psychological and psychiatric conditions requiring professional treatment. This makes it difficult to estimate the prevalence of dental phobia. Using DSM-5 diagnostic criteria for specific phobia could improve differential diagnosis (Roy-Byrne, Milgrom, Khoon-Mei, Weinstein, & Katon, 1994) and solve some of these difficulties. This would also make it possible to compare interventions for dental phobia with treatments for other specific phobias in contexts other than dentistry.

Using the DSM-IV, an earlier version of DSM-5, has meant uncertainty that could be helped by new formulations in the DSM-5 (Criterion F). DSM-IV disability criteria required that “The avoidance, anxious anticipation, or distress in the feared situation(s) interferes significantly with the person's normal routine, occupational (or academic) functioning, or social activities or relationships, or there is marked distress about having the phobia” (Criterion E).

The problem with this criterion is that very often, children and their parents do not feel that dental phobia interferes significantly with the children's normal routine, functioning, and activities. Dentistry is not something you encounter on a daily basis, and the consequences of dental phobia and suffering associated with it often become evident only later in life. Most children get taken to the dentist by their parents despite their fear and are not able to avoid treatment. Severe consequences in daily life, such as toothache and damaged oral health affecting psychosocial and general somatic health generally appear later in life. Children are often unaware of the long-term effects of their phobia and may not be particularly distressed about having the phobia. This has created a risk of under-diagnosis of dental phobia when children and parents receive psychiatric assessments that focus on the consequences of dental phobia in daily life, rather than focusing on the inability to undergo dental treatment.

In our research, which began before DSM-5 was published, we used DSM-IV diagnostic criteria for specific phobia adapted to a dental context (dentistry-related specific phobia). In accordance with earlier literature, we defined dental phobia as a “marked and persistent anxiety in relation to clearly discernible situations/objects (e.g. drilling, injections) or to the dental situation in general” (Klingberg & Broberg, 2007). We evaluated Criterion E based on how disabling the phobia was for the participant in the context of dentistry (not just in general life) and whether the phobia manifested as enduring treatment with dread and/or in an adjusted treatment situation, such as treatment with the help of sedation techniques. The new formulation in DSM-5 says: “The fear, anxiety, or avoidance causes clinically significant

distress or impairment in social, occupational, or other important areas of functioning.” This is an important change that reduces the risk of under-diagnosis of dental phobia in child psychiatric assessments, since “other important areas of functioning” can include dentistry. However, the existing structured interview manuals need to be changed and psychiatrists/psychologists working with children need to investigate the functionality/disability criteria in a dental context.

Another challenging assessment issue concerns Criterion G in DSM-IV and DSM-5, which requires that: “The disturbance is not better explained by the symptoms of another mental disorder.” In practice, this requires extensive psychiatric investigation by a psychologist or psychiatrist before establishing a diagnosis of a specific phobia (to be able to rule out other diagnoses that share symptoms with the specific phobia). This is a time-consuming task and it is uncertain if children and parents would be prepared to invest several hours at a dental clinic for psychiatric evaluation. To address this issue in our studies, we used the DAWBA, which is a complete DSM-IV-based psychiatric diagnostic system consisting of questionnaires that the participant and parent respond to online. We then performed a structured psychologist interview focusing on dental phobia (face-to-face in Study II and by telephone in Study III). One strength of the DAWBA is that it could be completed online at home, during times that the children and their parents found appropriate. A limitation of this approach is that the DAWBA is not as commonly used in the literature as other assessments, such as the Anxiety Disorders Interview Schedule for Children for DSM-IV (Silverman & Ollendick, 2005).

Choice of outcome measures

There is a need of standardized assessment methods for use in RCTs of psychotherapeutic interventions for dental phobia (Öst & Kvale, 2013). Due to a lack of adequate assessment instruments and test batteries, particularly in the context of pediatric dental phobia, our research team had to construct several psychological tests that were both adequate for the context of treatment and comprehensive for the participants.

The strengths of these assessment instruments included that they were customized for both children and adolescents and were highly specific with regard to pediatric dental phobia and our research questions. Particularly important was the BAT, which we used as a primary outcome measure instead of the CFSS-DS (the scale most used in the literature). There were several reasons for this choice. One was that the fear level measured by instruments such as the CFSS-DS may not accurately predict the ability to conduct challenging tasks for people with anxiety disorder (Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014).

Additionally, we learned from our studies and from the literature that many patients with dental phobia suffer from fear of intraoral injection and that they are unable to manage this procedure (Vika & Liljehaug Agsal, 2013; Vika et al., 2008). The CFSS-DS scales, however, have only one item measuring fear of intraoral injection and therefore CFSS:DS is inappropriate for measuring this fear (Lopes, Arnrup, Robertson, & Lundgren, 2013). Though researchers have recently developed the Intra-Oral Injection Fear scale for measuring injection phobia in dentistry, we did not have access to this instrument when we started our studies. It would be valuable if future studies used this new scale (Berge, Vika, Agdal, Lie, & Skeie, 2016).

We were not able to find any standardized BATs conducted in earlier studies in pediatric dentistry. So we constructed one on the basis of a BAT used in an adult CBT study (Haukebo et al., 2008). Our version was standardized; for example, all the participants received an injection in the same region of the mouth. We also adapted this new instrument to pediatric dentistry through measures such as providing specific and standardized instructions for parents or adults who accompanied the child to the clinic. Additionally, some instruments, like the Picture-Guided BAT, were specifically designed for use as online measurements. The main weakness of these instruments was that their reliability and validity calculations were based on a small data set.

The instruments we constructed may have the potential to become part of standardized test batteries for measuring pediatric dental phobia. In addition to other tests, we did employ the most widely used instrument for assessing dental fear in the literature, the child and parental versions of the CFSS-DS. The test battery we assembled covered behavioral (avoidance) and affective (fear and anxiety) and cognitive (self-efficacy and negative thoughts) aspects of dental phobia. These different aspects of phobia should be measured in treatment studies (Silverman & Ollendick, 2005). Experts also recommend using measures of physiological change such as heart rate, blood pressure, pulse, and/or skin conductance (Haukebo & Vika, 2103). We did not include physiological measures due to difficulties conducting reliable assessments adapted to the pediatric context.

Some have suggested that the best assessment would be an ecologically valid measure that evaluates whether patients are able to manage regular dental care after treatment for dental phobia (Öst & Kvale, 2013). This may be true for adults, but it is difficult to measure in a standard way for children and adolescents, who have limited and rapidly changing dental treatment needs. For instance, a child may need a restoration when he or she begins

treatment, but then that tooth exfoliates before treatment starts. This raises questions about how to evaluate phobia treatment. Using a standardized BAT, as we suggest, makes it possible to give an injection or drill on a piece of composite that has been placed on a tooth regardless of the individuals' dental treatment need. This approach creates an opportunity to simultaneously treat dental phobia, evaluate the treatment, and break the vicious circle of anxiety, independent of dental treatment need, which can help prepare a child for future dental care.

Who should deliver CBT for pediatric dental phobia?

An interesting issue in the field of dental phobia is who should offer CBT to patients. Should it be dental or psychiatric healthcare organizations? A dentist or a psychologist? What are the roles of dental hygienists and dental assistants in this context?

Oral health in children and adolescents is defined as “A state of sound and well-functioning dental and oral structures as well as absence of dental fear and anxiety” (Koch & Poulsen, 2009). Yet it is uncertain whether dentistry or psychiatry should be responsible for treating dental phobia in children and adolescents.

CBT is a psychotherapeutic method based on learning and cognitive psychology. Several years of training and supervision are necessary to become a skillful psychotherapist. Therefore, engaging a licensed psychologist or psychotherapist for assessment and treatment in CBT is unavoidable. Most psychologists and psychotherapists are employed at psychiatric facilities, and this favors referring patients with dental phobia to psychiatric care facilities. On the other hand, exposure is a fundamental intervention in CBT. Effective exposures, particularly for children and adolescents, require in-vivo exposures (in contrast to imagined exposure). This means that effective treatment requires access to dental care facilities and dental health staff. A psychologist or psychotherapist without access to dental care facilities and dental personnel has limited opportunity to conduct true in-vivo exposures. Furthermore, accurate evaluation of the phobia and the strength of its symptoms depends on observing the patient at a dental clinic.

Multidisciplinary treatment programs

Multidisciplinary treatment programs, in which the psychologist and dental health staff cooperate in a dental environment, are preferable and can minimize the risk that no one takes responsibility for children and adolescents with dental phobia. The literature has described several integrative programs. For instance, in a *Combined treatment* model, a psychologist conducts the diagnostic interview with the patients and plans the CBT based on one treatment

session, carried out by a dentist who has solid training in CBT (Haukebo et al., 2008). In the *Multimodal CBT* model, a psychologist gives 5–7 sessions of CBT at a dental clinic using a fully equipped dental chair and films related to dental treatment. The patient then meets the dental health staff for treatment after these sessions (Lundgren & Wide Boman, 2013; Wide Boman, Carlsson, Westin, & Hakeberg, 2013) or parallel to these sessions (Shahnavaz, 2012). The Combined and Multimodal models have mainly been used in adult dentistry. To our knowledge, the treatment manuals we present in this thesis are the first published CBT manuals for treating pediatric dental phobia. As indicated in the methods section, clinical psychologists delivered 10 sessions of treatment parallel with dental training/treatment (after Session 6) in Study II. The psychologists treating the patients were employed by the specialist pediatric dentistry clinic at Karolinska Institutet. Based on our experiences in these studies, the psychologist, being rooted in a dental context, could be an important factor that could enhance the effect of in-vivo exposures.

New ways of implementing CBT in dentistry

Although multidisciplinary face-to-face CBT treatment for dental phobia (delivered by psychologists and dental teams) is reasonable and effective, there are limited prospects for children and adolescents to have widespread access to this treatment in the short term. Among other issues, organizational difficulties employing and providing space for a psychologist/psychotherapist in dental health clinics represents a major barrier.

ICBT could help solve some of these problems. The method has a different approach compared to multimodal or one-session CBT treatments. Major parts of exposure are conducted at home (with the help of the exercise package and films available online) under supervision of the coach. Both the coach and the child or adolescent receive online guidance from a psychologist. By placing the main responsibility for exposure on the coaches rather than on the young patient, the likelihood of the patient completing the home exercises may improve. It is also possible that ICBT increases the number of training hours for the patient, which is crucial since brain mechanisms of fear are highly conserved (LeDoux, 2016) and extensive training is important for managing a phobia.

Beyond home training and exposures, ICBT includes training at a dental clinic after Module 6 in the treatment with the help of dentists, dental assistants, or dental hygienists. The dental team, the child, and parents decide together which of these professionals should train the patient in the dental context. In this way, dental assistants and hygienists can have an important role in treatment. Psychologist-guided ICBT may ease multidisciplinary treatment

of dental phobia without placing high demands on organizational change and coordination of visiting hours to suit children, parents, psychologists, and dentists at a specialist clinic.

Role of dental hygienists and dental assistants in treatment of dental phobia

The literature does not clearly describe the role of dental hygienists and dental assistants in treating and managing dental phobia. In practice, at least in Sweden, they often have a central role in supporting children and adolescents with dental fear or phobia to train and familiarize themselves with dentistry and its procedures. They also sometimes play an important part in bridging the treatments provided by the psychologist and dentist (Shahnavaz, 2012). Dental assistants have a key role in the challenging task of booking and coordinating the visits of children and parents to the dentist and psychologist in a structured way. It would be interesting to investigate the effect of dental hygienist and dental assistant involvement on CBT results in future studies. In the current version of ICBT, the dental health staff meeting the participants for training did not receive any training from the researchers and psychologists involved. Coaches gave short informational sheets about ICBT and its principles to the staff they met. The efficacy of treatment may be improved if the dental health staff can receive Internet-based training and supervision when they meet children and parents participating in ICBT. Moreover, creating a possibility for dental hygienists (who require two–three years of academic education in Sweden) to acquire supplementary education in CBT psychotherapy (after the undergraduate training) could also help supply the double competence needed for treating dental phobia.

METHODOLOGICAL LIMITATIONS

There were some limitations that should be considered when interpreting and implementing our results. Study I had the major limitation that the results were based on telephone interviews. More extensive face-to-face interviews might have generated data with higher quality. However, we were concerned that parents and children would decline participation if they were expected to take time off from work and school to participate in the study, so we chose telephone interviews. Study II was limited by the low number of randomized patients. This may reduce the representativeness of the sample and create limitations when generalizing results. Difficulties recruiting parents and participants who fulfilled the inclusion criteria and were willing to participate in the study caused the low number of participants. Potential participants included children and adolescents referred to specialist pediatric dentistry because of DBMP or dental fear. According to the literature, it is easier for dentists to identify DBMP compared to dental fear and phobia (Klingberg, 2013). Therefore,

participants with dental phobia may have been under-represented among referred participants. Other explanations for the low number of participants include other psychiatric problems, ongoing psychological treatments, parents strongly focused on dental care (sometimes emergency care) with little focus on dental phobia, and finally parental unwillingness (due to time pressure and the burdens of everyday life) to conduct extra visits for the assessment and psychological treatment included in the study. Moreover, 35% of patients in specialist pediatric dentistry are pre-school children (Klingberg et al., 2010) who could not be included in our studies. Our inclusion criteria were, perhaps, too strict, but despite our desire to achieve high external validity, we did not want to risk the internal validity of the study. The literature recognizes and describes difficulties in recruiting participants with a specific phobia diagnosis in general and those with dental phobia in particular, due to additional psychiatric problems, phobic avoidance, and a lack of treatment motivation (Antony & Barlow, 2004; Wide Boman et al., 2014).

Another limitation is related to the use of treatment as usual in the control group of Study II. This created difficulties defining and controlling the interventions in the Treatment as usual group, for instance, to match the number of visits in the control and intervention groups.

A distinct separation of the treatment conditions in order to avoid contamination was not possible. Some of the dentists meeting the participants in the Treatment as usual group may have implemented CBT strategies, and some participants in CBT have had access to the Tell-Show-Do method, which is included in routine treatment in pediatric dentistry. In the CBT group, however, only one participant needed adjunctive midazolam sedation due to a difficult extraction.

The major limitation of Study III was its lack of a control group and the consequent impossibility of conducting between-group comparisons. Other limitations of Study III included a lack of feedback from dental health staff concerning their experience with ICBT and the absence of a BAT conducted by a dentist.

Several of the tests used as outcome measures in Studies II and III are new. Limited reliability and validity data for these tests (including inter-rater reliability for clinician-administered tests) creates difficulties regarding interpretation of results. However, due to the lack of standardized assessment instruments and test batteries for children and adolescents (with a wide range of ages) participating in CBT studies of dental phobia (with randomized control design), we had to translate and construct several new outcome measures. The high consistency between our various outcome measures reduces the risk of faulty conclusions.

That results were in line with our hypotheses and showed clear differences between the treatment groups in Study II also indirectly suggests that the tests had acceptable reliability.

CLINICAL IMPLICATIONS, BARRIERS, AND FURTHER DIRECTIONS

All three studies were rooted in a clinical context and designed to improve assessment and treatment methods for children and adolescents with dental phobia. CBT for specific phobia and the methods included in the treatment have strong scientific support (Ollendick & King, 1998; Antony & Barlow, 2004; von Knorring et al., 2005; Öst, 2010; Davis, May, & Whiting, 2011; Newton, Asimakopoulou, Daly, Scambler, & Scott, 2012; Öst & Kvale, 2013). Yet many children and adolescents with dental phobia do not have access to this type of treatment. The main benefit to clinical practice of our studies is that they suggest concrete ways to offer CBT and how to evaluate it. We have created a variety of assessment instruments and treatment manuals for clinicians, children, and parents within the framework of our research.

The results of our studies and the material generated might help to reduce uncertainty about the possibility of applying CBT in pediatric dentistry and provide new ideas on how this can be done. Since there are few studies on these methods in the pediatric dental setting, there is need for replication of our studies by other research teams.

CBT in pediatric dentistry

Researchers and specialists in pediatric dentistry have done extensive work to create understanding and draw attention to the issues of children and adolescents with special psychological needs in dentistry. Contributions from Swedish researchers have been extensive, including several doctoral theses (Arnrup, 2003; Gustafsson, 2010; Holst, 1988; Klingberg, 2013). The focus has been on children and adolescents who, for various psychological reasons, cannot handle conventional dentistry. The methods developed in this research have mainly focused on alleviating treatment difficulties of children in a dental perspective. Less attention was paid to developing evidence-based methods for treating pediatric dental phobia.

Attention to treating pediatric dental phobia is important because Study II showed that Treatment as usual significantly improved the ability of children and adolescents to manage dental procedures in dentistry and reduce their fear. These changes, however, did not appear to be clinically significant. The Treatment as usual group failed to manage critical parts of dental treatment, such as local anesthesia and drilling, without sedation. Also, the proportion

of patients free from a dental phobia diagnosis was not significantly reduced. Moreover, treatment as usual apparently fails to enhance the self-efficacy of participants, which may be an important factor in achieving stable behavioral changes.

There is a great potential to develop the existing base for psychological interventions in pediatric dentistry further through improved differential diagnosis and implementing evidence-based, diagnosis-specific treatments in psychology and psychiatry.

Referrals to pediatric dentistry have been increasing for several years, leading to a heavy work load for specialists in Sweden. The largest group of referrals (37%) to specialist pediatric dentistry consists of children with dental phobia and/or DBMP combined with dental treatment needs (Klingberg et al., 2010). Multidisciplinary cooperation between psychologists and dental health staff at specialist and general clinics could reduce the work load for specialists.

Development of multidisciplinary cooperation has come much further in adult dental care, where access to psychologists/psychotherapists in a Swedish context is considerably larger and more uniform than in pediatric dentistry. This is due to organizational and economic resources developed in dentistry for patients with dental phobia (Shahnavaz, 2012).

Some of the important barriers for implementing CBT in pediatric dentistry are organizational and appear self-reinforcing. Children and adolescents have not been able to access psychologists and CBT because there has been no clear evidence that CBT is effective in pediatric dentistry. And there is no evidence that CBT works in pediatric dentistry because the psychologists who can deliver CBT are not available in pediatric dentistry.

A major problem we noted concerns difficulties employing psychologists/psychotherapists and giving them facilities in which to conduct CBT at dental health clinics. Dental health organizations need to create opportunities for CBT psychologists in pediatric dentistry. For instance, the CBT model used in Studies I and II requires access to a psychologist or psychotherapist with CBT competence who is integrated at a dental clinic. It is also important that the psychologists have access to a psychotherapy room with separate sections (or two different rooms) so that conversation and planning can take place in one part and exposure in another part, with a equipped dental chair and a TV screen. This is crucial for treatment success that requires in-vivo exposures. Furthermore, the psychologist engaged in the clinic needs to learn basic dental hygiene practices, how to operate the dental chair, and how to demonstrate and use the dental instruments without risk of injury. This is particularly important concerning procedures related to exposure to injection. The dental team cooperating with the psychologist needs to learn basic CBT principles and be able to focus on

psychological factors in a systematic way besides taking care of the dental treatment needs of patients. This means that cooperation with dental procedures should not be the only focus, but also direct treatment of dental phobia.

The national and international dental health community should form guidelines that stress the importance of access to CBT (and access to psychologists and therapy rooms) for children and adolescents in dentistry. To our knowledge, access to integrated psychologist-dentist CBT for children with dental phobia is restricted to a few specialist or academic clinics around the world.

ICBT in pediatric dentistry

The ICBT developed in Study III has the potential to fill the gap between treatment needs and level of access to evidence-based psychological methods by implementing new strategies (Gyani, Shafran, Layard, & Clark, 2013).

Implementing ICBT can reduce some of the barriers to treatment of dental phobia such as: a) the need for employing and creating rooms for psychologists at individual clinics, which encompasses both economic barriers (as personnel costs for ICBT psychologists are lower than for face-to-face CBT) and also difficulties finding and recruiting CBT psychologists willing to work in dentistry, b) parent- and child-related barriers, such as the burden of daily life, which involves difficulties taking time off from work and school, c) access to specialist pediatric dentistry, which many patients are unable to receive because they live in parts of the country without specialized pediatric dental care, forcing them to travel long distances to specialist clinics to get help (Klingberg et al., 2010), d) difficulties making several systematic appointments with dentists, psychologists, parents, and children, and e) the potential risk of stigma related to visiting a psychologist (Lenhard et al., 2014). However, a major challenge, concerning ICBT is creating a patient-secure internet platform that is adapted to pediatric dentistry and usable for research, clinical assessments, and treatments (the platform used in Study III was available to us only for research purposes). Thus, collaboration between researchers, clinicians, managers, commissioners, and politicians to find a way to provide access to ICBT as part of routine clinical treatment in general and dental health care is an important issue.

Access to Internet-based CBT does not mean that the need for face-to-face CBT will diminish. ICBT, for instance, may not be suitable for children who, for various reasons, cannot get support from parents or other adults in their immediate environment.

Stepped-care model

One idea might be to develop a stepped-care approach in dentistry for children and adolescents with dental fear and/or DBMP, offering the least costly and most practical method first and more costly or complex procedures only if the less expensive intervention proves unsuccessful (Klepac, 1988). For instance, unguided ICBT (Marshman et al., 2016) could be recommended as the first line of treatment, with guided ICBT at a later stage and dental-team–psychologist integrated CBT offered at even later stage, and general anesthesia at a final stage (unless emergency dental care becomes necessary).

With implementation of a stepped-care model, one should not overlook the value of a comprehensive diagnostic procedure that can suggest the right level of treatment from the beginning and thus spare the patient experiences of failure that reduce the chance for other, more complicated treatments to work.

Crossroads between dental care and healthcare, addressing injection phobia and pain

In line with the literature (Vika & Liljehaug Agsal, 2013), many of the participants in our studies reported intraoral injection phobia as a main barrier to dental care. However, in contrast to the general perception that dental fear is always connected to experiences in dental care, our descriptive data in Study III suggested that, in many cases (60%), dental phobia is linked to negative experiences of injection in a healthcare context (e.g., vaccination), which have then been generalized to dentistry. From this perspective, it is important that evidence-based approaches for prevention of injection phobia be implemented by both dental and healthcare staff (Hedén et al., 2009; Birnie et al., 2015) and that dental care and general healthcare systems cooperate on this issue. Medical and dental records should always include questions about the patient's feelings about injections.

Continued fear of injection in healthcare could threaten improvement from CBT for dental phobia and enhance the risk of relapse to intraoral injection phobia. Therefore, treatment of phobia could be strengthened by collaboration between the health and dental care staff with a focus on injection phobias. Patients should be able to generalize their skills from dental care to healthcare and vice versa if, for example, there is cooperation between psychologists in dentistry and nurses providing primary pediatric healthcare.

Dental phobia is one of a few specific phobias where exposure to the phobic situation may cause pain. Despite this, researchers in the field have not developed specific treatments for

this phobia (Öst & Kvale, 2013). Our treatment manuals in Studies II and III meet this need for dentistry-specific CBT; they contain, for instance, recommendations on how parents can relate to their children and their dentist in the treatment room. In our studies, parental presence in the treatment room was always discussed and planned. Furthermore, the treatment manuals contained a pain management chapter designed to give participants coping strategies to deal with pain during or after dental care, for example, in conjunction with tooth extraction. As with injection phobia, pain management strategies need to be generalized to healthcare for children and adolescents who may need to undergo painful medical procedures.

Attitudinal barriers to treatment of dental phobia

A major barrier to treatment of medical specific phobias, including dental phobia, could be attitude-based. In many cases, neither children or adolescents, nor parents, nor medical/dental care staff have the motivation needed to invest in long-term treatment of specific phobias. Instead, they choose short-term strategies, such as sedation techniques, that make dental treatment possible without addressing or treating the dental phobia itself. Increasing use of general anesthesia and sedation techniques, in combination with limited knowledge about how general practitioners treat anxious or uncooperative children, gives some evidence for the concern that children and adolescents do not receive adequate psychological help (Klingberg et al., 2010). There could be several reasons for the strong focus on short-term strategies: a) the urgency of the dental interventions that need to be performed, b) avoidance of the anxiety that must be confronted during CBT, c) the burden of daily life for parents (including difficulties taking time off from work and school) and limited office hours, d) the notion that children will grow out of their phobia without treatment, and e) the risk of experiencing stigma by visiting a psychologist.

To address these barriers there is a need for informational campaigns organized by dental health organizations directed to dental health staff, parents, and children and adolescents. The information needs to stress the long-term benefits of treating dental phobia and warn about the consequences of not treating it.

Future research

The results of ICBT for pediatric dental phobia in the open trial we conducted were promising. ICBT has the potential to increase access to evidence-based psychological treatments with relatively low personnel costs (compared to face-to-face treatment), regardless of where patients and their families live or their access to specialist pediatric dental

care. There is a need to test the treatment in randomized controlled trials. There is also a need both for replication of our face-to-face CBT study and for RCTs of shorter versions of CBT, such as one-session treatment of pediatric dental phobia. The CBT manuals we developed are complex and contain many different interventions, which makes it difficult to identify the mechanism of change. Our studies, however, suggested that self-efficacy may be a mechanism of change. It would be interesting to offer and evaluate only those parts of the CBT manual that particularly focused on self-efficacy, for instance, through model learning via film in pediatric dentistry. It would also be interesting to test the efficacy of One-Session Treatment of Dental Phobia in pediatric dentistry. We did not offer booster sessions to patients in our studies. Booster sessions may increase the efficiency of CBT and patients' ability to generalize the treatment effect to other areas in life. Therefore, it may be worth trying to offer booster sessions in future studies. Cost-effectiveness studies of CBT for pediatric dental phobia are also important to conduct in future.

Within the framework of this thesis we had to introduce new assessment instruments appropriate for evaluating CBT, offered in a randomized controlled format, as well as for ICBT. For instance, we were not able to find a standardized behavioral avoidance/approach test or any tests of child- and parent-reported self-efficacy in pediatric dentistry. We find the instruments we used promising, but they require further research. Studies conducted in this thesis focused on school children and adolescents. There is also need for research on CBT interventions for pre-school children with dental phobia. ICBT intervention for pre-school children with anxiety disorder, directed at parents can, for instance, be adapted to dental care and offered to children with dental phobia.

Methods and treatments investigated in our studies focused on children with a primary diagnosis of dental phobia. Some part of the knowledge that our studies contributed, however, may be applicable to children with other primary diagnoses, such as developmental or conduct disorders. Established CBT models for conduct disorders can, for instance, be adapted and implemented for treating DBMP in dentistry in the same manner we adapted methods for our studies. Using ICBT to facilitate interaction between children and adolescents, coaches, and the medical/dental care staff is a novel approach implemented in Study III. There is potential to further develop this approach by increasing the interaction between Internet psychologists and the dental care staff, for instance, by providing access to brief ICBT courses that includes supervision by the dental care staff. As highlighted in the literature (Öst & Skaret, 2013), it is important for future research to explore the possibility of

developing a self-report questionnaire criteria for pediatric dental phobia, based on DSM 5, that is as reliable as diagnostic interviews.

The impact on global climate change of general anesthetic use and emission of gases such as nitrous oxide (part of treatment as usual) in health care and dentistry could be substantial (Ishizawa, 2011). It would be interesting to investigate whether more widespread use of CBT in dentistry would reduce environmental impact.

In closing, my hope is that this thesis creates new cross-disciplinary bridges and stimulates collaboration between psychologists and dental staff that improves the availability of evidence-based psychological treatments for children and adolescents in dentistry. These treatments have the potential to reduce vulnerability and fear for children and adolescents and increase their control and self-efficacy in dentistry and in general. Dental care organizations may also, through these treatments, enhance their ability to promote both dental and psychological health in children and adolescents. I also hope that these studies contribute to the body of knowledge in the field of CBT for children and adolescents in general.

CONCLUSIONS

School-aged children and adolescents with dental phobia who receive CBT could benefit from the treatment. They experienced mastery, reduced fear, and increased feelings of safety, which helped them to change their view of dentistry and their own potential (perspective shift). CBT was more efficacious than treatment as usual. Treatment as usual improved the ability of children and adolescents to manage dental procedures and reduced their fear. However, the Treatment as usual group failed to manage critical parts of dental treatment, such as local anesthesia and drilling, without sedation. The portion of patients free from a dental phobia diagnosis was also not significantly reduced in this group. Moreover, treatment as usual apparently fails to enhance the self-efficacy of participants, which may be an important factor in achieving stable behavioral changes.

Children and adolescents in the CBT group improved more in their ability to manage dental procedures and showed reduced anxiety and increased self-efficacy, compared to the Treatment as usual group. Children and adolescents participating in a novel, psychologist-guided Internet-based CBT program improved their ability to manage procedures in dental care. For the children and adolescents, dental fear and negative thoughts decreased while both participants and coaches (parents) experienced increased self-efficacy. CBT is an efficacious treatment for children and adolescents with dental phobia and should be made accessible in pediatric dentistry. ICBT seems to have effects similar to face-to-face CBT. The efficacy of ICBT needs to be confirmed in future randomized controlled trials.

ACKNOWLEDGMENTS

Finally, I wish to express my warmest thanks to all who have contributed to make this work possible. My sincere gratitude to:

All **participating children, adolescents, and parents** (coaches) who generously gave their time and guided us through this work by sharing their experiences and thoughts about dental phobia and CBT.

Professor **Göran Dahllöf**, my primary supervisor, who was a true pioneer in providing me the opportunity to be the first psychologist to conduct PhD studies at the Department of Dental Medicine at KI. Göran, your openness for new ideas (including those you don't like), your knowledge and kindness, your support and politeness, even under tough circumstances, is unique and invaluable. It has been a privilege to work with you.

My co-supervisors, Associate Professors **Erik Hedman** and **Lotta Reuterskiöld**. Your precision and perspicacity in finding solutions to challenging problems is amazing. You have been my role models in research, and it has been thanks to you that I have never doubted my ability to finish this work.

Co-supervisor, DDS, PhD, senior consultant, **Margaret Grindefjord**, for introducing me to pediatric dentistry 10 years ago, when my engagement in pediatric dental phobia began. Your support and concrete solutions for complex procedural and organizational challenges during the research work has been invaluable.

Co-supervisor **Viktor Kaldo** and former co-supervisor **Nils Lindefors**, for seeing the potential of this work and being open to cross-organizational and interdisciplinary cooperation. Thanks for giving me access to the internet platform and for sharing with me your unique knowledge of ICBT. Thanks Viktor for the early discussions and ideas that ended up in the Picture-guided behavior avoidance test.

Psychologists **Tove Hasselblad** and **Sara Ytterbrink**, for careful engagement and important contributions to the planning, design, and implementation of Studies II and III. And psychologist **Robert Shibbye**, who took great responsibility for the clinical psychological work at our department, allowing for me to concentrate on writing the present dissertation.

Psychologist and PhD student, **Niels Eék** for helping me to get started with the internet-platform and teaching me how to use it.

DDS and specialist in pediatric dentistry, **Mia Mariana Penttinen**, for supporting my research work and introducing me to my main supervisor and the Department of Dental Medicine at KI, which eventually led to this research project.

PhD, DDS, specialists in pediatric dentistry, **Biniyam Wondimu, Monica Barr Agholme, Georgios Tsilingaridis, Gunilla Pousette Lundgren, Barbro Malmgren, Cecilia Ziegler** and **Maria Andersson** (PhD-student) for encouraging and supporting me in my research work. Being surrounded by so many knowledgeable people has made me feel safe.

Former students of the Dental Medicine program at KI, and who are now dentists: **Sara Rutley, Karin Larsson, Nabil Odisho, Igor Kraszewski, Mahta Hosseinkhani Hazaveh, Nazanin Hassas, Martin Alvarsson, Karl Thoma, Mattias Lindsäter, and Beatrice Heckscher**, for their contributions to the various studies.

The wonderful movie actors who played the roles of young patients: **Karl and Kristina Agholme, Sissel Svensson, and Viggo and Lo Shahnnavaz**. And those in the roles of dentist and dental assistants (all dentists in real life): **Monica Barr Agholme, Mia Mariana Penttinen, Alexander Fässberg, Mahta Hosseinkhani Hazaveh, Nazanin Hassas, Martin Alvarsson, Anneli Hertz**. Thank you for performing in the film shorts used in the CBT and ICBT programs. You did a marvelous job and played your rolls well. To me, you are better than any Hollywood star could be.

Stefan Glodic who has generously put in effort and time in this research by being part of the pictures that illustrated dental procedures included in ICBT.

PhD students **Ida Brännemo** and **Kristofer Andersson** and post-graduate students **Vera Glodic, Stina Ekström, Caroline Skutberg, Therese Kvist, Isabelle Miglis, Maria Lundmark, and Anneli Hertz**, for supporting my research and conducting the challenging behavioral tests in Study II.

Dental assistants **Diana Åberg, Susanna Fryxell, Åsa Wållberg-Whelan, Ann Kantorp, Pia Svensson, Jeannette Ramirez, Katarina Andersson, and Helena Bargalle**; and dental hygienist **Shirin Tavana** (my dear office mate); and **Ulla-Britt Ek-Ehrlemark**: for all valuable help and assistance in carrying out this research. Special thanks to dental assistant **Katarina Edentorp Eriksson**, who invested much effort in coordinating the various parts of our studies and has contributed to adapting CBT to dental care through her extensive clinical experience and knowledge. Without your efforts, Katarina, it would have been impossible to complete the studies in this thesis.

Department administrator, **Eva Segelöv**, for prolonged support and help with the heavy administration related to the studies and the thesis.

DDS, PhD, **Jeong Tae-Sung** and post-graduate student **Zaina Al Qahtani** for encouraging talks and showing interest in my research.

Colleagues and friends at Eastmaninstitutet, Public Dental Service, for cooperation and support of this research. In particular, dental assistants **Ulrika Lönnblad** and **Berit Lundquist** who contributed to Study II during the recruitment phase.

Associate professor, **Gunilla Berglund**, my external mentor for supporting and encouraging me.

Associate professor, **Eva Serlachius** for supporting me.

My informal supervisors, my children **Viggo** and **Lo Shahnnavaz**, who have generously put in a lot of effort and time in their father's research. They have enriched the treatment manual from a child's perspective through their feedback and comments, helping me to produce animations and by being part of the pictures and films that illustrated dental procedures in the treatment. Viggo and Lo, you have taught me so much. Without inspiration from you, this work would never have occurred.

Language consultant **Gail Conrod**, for excellent language revision and the translation of the ICBT treatment manual. Thank you Gail for your conscientious and careful work.

Psychology student **Deborah Wedemalm** for translation of the CBT therapist manual.

Frida Lundberg, for layout help, and **Robin Ejnebrand**, for the illustrations that have graced the ICBT treatment manual and cover of this thesis. Special thanks to Frida for emergency aid the night before submission of the thesis.

My parents, **Noushin Modavi** and **Anoushiravan Shahnnavaz** and their partners **Gornig Khoram** and **Servat Ajami**, who have encouraged me to pursue research and always placed great value on higher education and research.

My mother-in-law **Margareta Lignell**, who has always made my life cheerful and always showed interest in my research.

My sisters, **Avazeh** and **Azadeh**, and my brother, **Afshin**, and his wife, **Anna**, and their children **Nora** and **Adrian**, for supporting me in a myriad of ways.

My football friends, who have kept me alive physically during the research years and my other friends, particularly PhD **Nader Nourizad** and **Karin Johansson Blight** for having been sources of inspiration and for encouraging me to invest in research.

My wife, associate professor, **Anna Lundberg**, who has encouraged me and never doubted that I would finish my thesis. Thank you for your contributions throughout, for the linguistic feedback to some of the tests we constructed, and for giving me much-needed and valuable space and time, including on many of our holidays, to work with my thesis.

Singer song-writer **Laleh Pourkarimi** and the Persian poet **Rumi**, who have lifted me up and given me perspective and hope when I felt stuck in this work. “Just because it’s black in the dark. Doesn’t mean there’s no color” (Laleh) and “Stop acting so small. You are the universe in ecstatic motion.” (Rumi).

If you received no mention here, please take no offense, it is merely an oversight; please, please contact me, so that I may thank you personally. I am grateful for all help I have received from all quarters over these years. Thank you all!

Grants

I also thank the **Mayflower Charity Foundation for Children** and **Karolinska Institutet** and **Stockholm County Council** for financially supporting the studies in this thesis.

REFERENCES

- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (4th ed., text rev.)*. Washington, DC.
- American Psychiatric Association. (2013). Highlights of Changes from DSM-IV-TR to DSM-5. Retrieved October 24, 2016, from <http://www.dsm5.org/documents/>
- Andersson, G., Cuijpers, P., Carlbring, P., Riper, H., & Hedman, E. (2014). Guided Internet-based vs. face-to-face cognitive behavior therapy for psychiatric and somatic disorders : a systematic review and meta-analysis. *World Psychiatry, 13*(3), 288–295.
- Antony, M. M., & Barlow, D. H. (2004). Specific phobias. In D. H. Barlow (Ed.), *Anxiety and Its Disorders* (2nd ed., pp. 380–418). London: The Guilford Press.
- Armfield, J. M. (2010). Towards a better understanding of dental anxiety and fear: Cognitions vs. experiences. *European Journal of Oral Sciences, 118*(3), 259–264.
- Arnrup, K. (2003). *Pediatric dentistry meets clinical child psychology. Studying groups of uncooperative child dental patients* (Doctoral dissertation). University of Gothenburg.
- Ashley, P., Cecs, W., & Parry, J. (2015). Sedation versus general anaesthesia for provision of dental treatment to patients younger than 18 years (Review). *Cochrane Database of Systematic Reviews, (9)*.
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. Worth Publishers.
- Barlow, D. H. (2002). *Anxiety and Its Disorders, Second Edition: The Nature and Treatment of Anxiety and Panic* (Vol. 18). New York: Guilford Publications.
- Beidas, R. S., Benjamin, C. L., Puleo, C. M., Edmunds, J. M., & Kendall, P. C. (2010). Flexible Applications of the Coping Cat Program for Anxious Youth. *Cognitive and Behavioral Practice, 17*(2), 142–153.
- Berge, K. G., Vika, M., Agdal, M. L., Lie, S. A., & Skeie, M. S. (2016). Reliability, validity and cutoff score of the Intra-Oral Injection Fear scale. *International Journal of Paediatric Dentistry, 1*–10.
- Berggren, U. (1984). *Dental fear and avoidance: A study of Aetiology, consequences and treatment*. University of Gothenburg.
- Birnie, K. a., Chambers, C. T., Taddio, A., McMurtry, C. M., Noel, M., Pillai Riddell, Shah, V. (2015). Psychological Interventions for Vaccine Injections in Children and Adolescents: Systematic Review of Randomized and Quasi-Randomized Controlled Trials. *The Clinical Journal of Pain, 31 Suppl 1*(10), S72–S89.

- Boman, U. W., Lundgren, J., Berggren, U., & Carlsson, S. G. (2010). Psychosocial and dental factors in the maintenance of severe dental fear. *Swedish Dental Journal*, 34(3), 121–7.
- Carter, A. E. (2014). Pathways of fear and anxiety in dentistry: A review. *World Journal of Clinical Cases*, 2(11), 642.
- Colares, V., Franca, C., Ferreira, a., Amorim Filho, H. a., & Oliveira, M. C. a. (2013). Dental anxiety and dental pain in 5- to 12-year-old children in Recife, Brazil. *European Archives of Paediatric Dentistry*, 14(1), 15–19.
- Craske, M. G., Treanor, M., Conway, C. C., Zbozinek, T., & Vervliet, B. (2014). Maximizing exposure therapy: An inhibitory learning approach. *Behaviour Research and Therapy*, 58(310), 10–23.
- Davis, T. E., May, A., & Whiting, S. E. (2011). Evidence-based treatment of anxiety and phobia in children and adolescents: current status and effects on the emotional response. *Clinical Psychology Review*, 31(4), 592–602.
- Davis, T. E., Ollendick, T. H., & Öst, L.-G. (2012). *Intensive One-Session Treatment of Specific Phobias*. New York: Springer.
- Donovan, C. L., & March, S. (2014). Online CBT for preschool anxiety disorders: A randomised control trial. *Behaviour Research and Therapy*, 58, 24–35.
- Ebert, D. D., Zarski, A. C., Christensen, H., Stikkelbroek, Y., Cuijpers, P., Berking, M., & Riper, H. (2015). Internet and computer-based cognitive behavioral therapy for anxiety and depression in youth: A meta-analysis of randomized controlled outcome trials. *PLoS ONE*, 10(3), 1–15.
- Esa, R., Ong, A. L., Humphris, G., & Freeman, R. (2014). The relationship of dental caries and dental fear in Malaysian adolescents: a latent variable approach. *BMC Oral Health*, 14(1), 19.
- Flatt, N., & King, N. (2009). The Self-Efficacy Questionnaire for Phobic Situations (SEQ-SP): Development and Psychometric Evaluation. *Behaviour Change*, 26(2), 141–152.
- Flay, B. R., Biglan, A., Boruch, R. F., Castro, F. G., Gottfredson, D., Kellam, S., ... Ji, P. (2005). Standards of evidence: Criteria for efficacy, effectiveness and dissemination. *Prevention Science*, 6(3), 151–175.
- Gallagher, M. W., Payne, L. A., White, K. S., Shear, K. M., Woods, S. W., Gorman, J. M., & Barlow, D. H. (2013). Mechanisms of change in cognitive behavioral therapy for panic disorder: the unique effects of self-efficacy and anxiety sensitivity. *Behaviour Research and Therapy*, 51(11), 767–77.
- Golkar, A., Selbing, I., Flygare, O., Ohman, A., & Olsson, A. (2013). Other people as means to a safe end: vicarious extinction blocks the return of learned fear. *Psychological Science*, 24(11), 2182–90.
- Goodman, R., Ford, T., Richards, H., Gatward, R., & Meltzer, H. (2000). The Development and Well-Being Assessment: description and initial validation of an integrated

- assessment of child and adolescent psychopathology. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 41(5), 645–655.
- Gould, R. a., & Clum, G. a. (1993). A meta-analysis of self-help treatment approaches. *Clinical Psychology Review*, 13(2), 169–186.
- Gustafsson, A. (2010). *Dental behaviour management problems among children and adolescents – a matter of understanding? Studies on dental fear, personal characteristics and psychosocial concomitants* (Doctoral dissertation). University of Gothenburg.
- Gyani, A., Shafran, R., Layard, R., & Clark, D. M. (2013). Enhancing recovery rates: Lessons from year one of IAPT. *Behaviour Research and Therapy*, 51(9), 597–606.
- Hakeberg, M. (1992). *Dental anxiety and health: a prevalence study and assessment of treatment outcome*. University of Gothenburg.
- Hakeberg, M., Berggren, U., Carlsson, S. G., & Gröndahl, H. G. (1993). Long-term effects on dental care behavior and dental health after treatments for dental fear. *Anesthesia Progress*, 40(3), 72–7.
- Hakeberg, M., & Lundgren, J. (2013). Symptoms, Clinical Characteristics and Consequences. In Öst & E. Skaret (Eds.), *Cognitive Behaviour Therapy for Dental Phobia and Anxiety*. John Wiley & Sons, Ltd.
- Hallonsten, a L. (1988). Sedation by the use of inhalation agents in dental care. *Acta Anaesthesiologica Scandinavica Supplementum*, 88(8), 31–35.
- Haukebo, K., Skaret, E., Ost, L.-G., Raadal, M., Berg, E., Sundberg, H., & Kvale, G. (2008). One- vs. five-session treatment of dental phobia: a randomized controlled study. *Journal of Behavior Therapy and Experimental Psychiatry*, 39(3), 381–90.
- Haukebo, K., & Vika, M. (2103). Assessment of dental phobia and anxiety. In L. Öst & E. Skaret (Eds.), *Cognitiv Behaviour Therapy for Dental Phobia and Anxiety*. Wiley & Sons, Ltd.
- Heaton, L. J., Leroux, B. G., Ruff, P. A., & Coldwell, S. E. (2013). Computerized dental injection fear treatment: a randomized clinical trial. *Journal of Dental Research*, 92(7 Suppl), 37S–42S.
- Hedén, L., Von Essen, L., & Ljungman, G. (2009). Randomized interventions for needle procedures in children with cancer. *European Journal of Cancer Care*, 18(4), 358–363.
- Hedman, E., Ljótsson, B., & Lindefors, N. (2012). Cognitive behavior therapy via the Internet: a systematic review of applications, clinical efficacy and cost-effectiveness. *Expert Review of Pharmacoeconomics & Outcomes Research*, 12(6), 745–64.
- Holst, A. (1988). *Behaviour Management Problems in Child Dentistry* (Doctoral dissertation). University of Lund.

- Ishizawa, Y. (2011). General anesthetic gases and the global environment. *Anesthesia and Analgesia*, 112(1), 213–217.
- Kaufman, Birmaher, Rao, R. (1996). Diagnostic Interview Kiddie-Sads-Present and Lifetime Version (K-SADS-PL).
- Kebriaee, F., Sarraf Shirazi, a., Fani, K., Moharreri, F., Soltanifar, a., Khaksar, Y., & Mazhari, F. (2015). Comparison of the effects of cognitive behavioural therapy and inhalation sedation on child dental anxiety. *European Archives of Paediatric Dentistry*, 16(2), 173–179.
- King, N. J., Ollendick, T. H., & Murphy, G. C. (1997). Assessment of childhood phobias. *Clinical Psychology Review*, 17(7), 667–87.
- Klepac, R. K. (1988). Behavioral treatments for adult dental avoidance. A stepped-care approach. *Dental Clinics of North America*, 32(4), 705–14.
- Klingberg, G. (1994). Reliability and validity of the Swedish version of the Dental Subscale of the Children's Fear Survey Schedule, CFSS-DS. *Acta Odontologica Scandinavica*, 52(4), 255–6.
- Klingberg, G. (2002). Pharmacological approach to the management of dental anxiety in children - Comments from a Scandinavian point of view. *International Journal of Paediatric Dentistry*, 12(5), 357–358.
- Klingberg, G., Andersson-Wenckert, I., Grindefjord, M., Lundin, S. a, Ridell, K., Tsilingaridis, G., & Ullbro, C. (2010). Specialist paediatric dentistry in Sweden 2008 - a 25-year perspective. *International Journal of Paediatric Dentistry*, 20(5), 313–321.
- Klingberg, G. & Broberg, A. G. (2007). Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. *International Journal of Paediatric Dentistry*, 17(6), 391–406.
- Klingberg, G. (2013). Dental Anxiety in Children and Adolescents. In L. Öst & E. Skaret (Eds.), *Cognitiv Behaviour Therapy for Dental Phobia and Anxiety*. Wiley & Sons, Ltd.
- Koch, G., & Poulsen, S. (2009). *Pediatric Dentistry: A Clinical Approach*. Wiley & Sons, Ltd.
- Kvale, G., Berggren, U., & Milgrom, P. (2004). Dental fear in adults: a meta-analysis of behavioral interventions. *Community Dentistry and Oral Epidemiology*, 32(4), 250–64.
- LeDoux, J. (2016). *Anxious: Using the Brain to Understand and Treat Fear and Anxiety*. Penguin Publishing Group.
- Lenhard, F., Vigerland, S., Andersson, E., Ruck, C., Mataix-Cols, D., Thulin, U., ... Serlachius, E. (2014). Internet-delivered cognitive behavior therapy for adolescents with obsessive-compulsive disorder: An open trial. *PLoS ONE*, 9(6).

- Lindfors, N., & Andersson, G. (2016). *Guided Internet-Based Treatments in Psychiatry*. Springer.
- Locker, D. (2003). Psychosocial consequences of dental fear and anxiety. *Community Dent Oral Epidemiol*, 31(2), 144–151.
- Lopes, D., Arnrup, K., Robertson, A., & Lundgren, J. (2013). Validating the dental subscale of the children's fear survey schedule using Rasch analysis. *European Journal of Oral Sciences*, 121, 277–82.
- Lundgren, J., & Wide Boman, U. (2013). Multimodal Cognitive Behavioral Treatment. In *Cognitiv Behaviour Therapy for Dental Phobia and Anxiety*. John Wiley & Sons, Ltd.
- Luoto, A., Lahti, S., Nevanperä, T., Tolvanen, M., & Locker, D. (2009). Oral-health-related quality of life among children with and without dental fear. *International Journal of Paediatric Dentistry*, 19(2), 115–20.
- Lyneham, H. J., Abbott, M. J., & Rapee, R. M. (2003). *The Cool Kids Family Program-Therapist Manual*. Sydney: Maura: Macquaire University.
- March, S., Spence, S. H., & Donovan, C. L. (2009). The efficacy of an internet-based cognitive-behavioral therapy intervention for child anxiety disorders. *Journal of Pediatric Psychology*, 34(5), 474–87.
- Marshman, Z., Gibson, B. J., Owens, J., Rodd, H. D., Mazey, H. U. W., Baker, S. R., ... Robinson, P. G. (2007). Seen but not heard : a systematic review of the place of the child in 21st-century dental research. *International Journal of Paediatric Dentistry*, 17, 320–327.
- Marshman, Z., Morgan, A., Porritt, J., Gupta, E., Baker, S., Creswell, C., ... Rodd, H. (2016). Protocol for a feasibility study of a self-help cognitive behavioural therapy resource for the reduction of dental anxiety in young people. *Pilot and Feasibility Studies*, 2(1), 13.
- McMurtry, C. M., Pillai Riddell, R., Taddio, A., Racine, N., Asmundson, G. J. G., Noel, M., ... Shah, V. (2015). Far From “Just a Poke.” *The Clinical Journal of Pain*, 31(10), S3–S11.
- Mejäre, I. a, Klingberg, G., Mowafi, F. K., Stecksén-Blicks, C., Twetman, S. H. a, & Tranæus, S. H. (2015). A systematic map of systematic reviews in pediatric dentistry--what do we really know? *PloS One*, 10(2), 1–21.
- Melamed, B. G., Yurcheson, R., Fleece, E. L., Hutcherson, S., & Hawes, R. (1978). Effects of film modeling on the reduction of anxiety-related behaviors in individuals varying in level of previous experience in the stress situation. *Journal of Consulting and Clinical Psychology*, 46(6), 1357–67.
- Milgrom, P., Weinstein, P., & Getz, T. (1995). *Treating Fearful Dental Patients: A Patient Management Handbook*. University of Washington, Continuing Dental Education.

- Morgan, A. G., Rodd, H. D., Porritt, J. M., Baker, S. R., Creswell, C., Newton, T., ... Marshman, Z. (2016). Children's experiences of dental anxiety. *International Journal of Paediatric Dentistry*, 1–11.
- Newton, T., Asimakopoulou, K., Daly, B., Scambler, S., & Scott, S. (2012). The management of dental anxiety: time for a sense of proportion? *British Dental Journal*, 213(6), 271–274.
- Ollendick, T., & King, N. (1998). Empirically supported treatments for children with phobic and anxiety disorders: Current status. *Journal of Clinical Child Psychology*, 27(2), 37–41.
- Podell, J. L., Mychailyszyn, M., Edmunds, J., Puleo, C. M., & Kendall, P. C. (2010). The Coping Cat Program for Anxious Youth: The FEAR Plan Comes to Life. *Cognitive and Behavioral Practice*, 17(2), 132–141.
- Porritt, J., Marshman, Z., & Rodd, H. D. (2012). Understanding children's dental anxiety and psychological approaches to its reduction. *International Journal of Paediatric Dentistry*, 22(6), 397–405.
- Raghav, K., Van Wijk, A. J., Abdullah, F., Islam, M. N., Bernatchez, M., & De Jongh, A. (2016). Efficacy of virtual reality exposure therapy for treatment of dental phobia: a randomized control trial. *BMC Oral Health*, 16(1), 25.
- Reuterskiöld, L. (2009). *Fears, anxieties and cognitive-behavioral treatment of specific phobias in youth* (Doctoral dissertation). Stockholm University.
- Roberts, J. F., Curzon, M. E. J., Koch, G., & Martens, L. C. (2010). Behaviour Management Techniques in Paediatric Dentistry. *European Archives of Paediatric Dentistry*, 11(4), 166–174.
- Rooksby, M., Elouafkaoui, P., Humphris, G., Clarkson, J., & Freeman, R. (2015). Internet-assisted delivery of cognitive behavioural therapy (CBT) for childhood anxiety: Systematic review and meta-analysis. *Journal of Anxiety Disorders*, 29, 83–92.
- Roy-Byrne, P. P., Milgrom, P., Khoon-Mei, T., Weinstein, P., & Katon, W. (1994). Psychopathology and psychiatric diagnosis in subjects with dental phobia. *Journal of Anxiety Disorders*, 8(1), 19–31.
- Scambler, S. (2016). The dentist in society. In S. Scambler, S. Scott, & K. Asimakopoulou (Eds.), *Sociology & Psychology for the Dental Team* (pp. 236–254). Polity.
- Shahnavaz, S. (2012). *Tandvårdspsykologi*. Lund: Studentlitteratur.
- Silverman, W. K., & Ollendick, T. H. (2005). Evidence-Based Assessment of Anxiety and Its Disorders in Children and Adolescents. *Journal of Clinical Child and Adolescent Psychology*, 34(3), 380–411.
- Skaret, E., Berg, E., Kvale, G., & Raadal, M. (2007). Psychological characteristics of Norwegian adolescents reporting no likelihood of visiting a dentist in a situation with toothache. *International Journal of Paediatric Dentistry*, 17(6), 430–438.

- Spence, S. H., Donovan, C. L., March, S., Gamble, A., Anderson, R. E., Prosser, S., & Kenardy, J. (2011). A randomized controlled trial of online versus clinic-based CBT for adolescent anxiety. *Journal of Consulting & Clinical Psychology*, 79(5), 629–642.
- Sucala, M., Schnur, J. B., Constantino, M. J., Miller, S. J., Brackman, E. H., & Montgomery, G. H. (2012). The therapeutic relationship in e-therapy for mental health: a systematic review. *Journal of Medical Internet Research*, 14(4), e110.
- Svensson, L., Larsson, Å., & Öst, L. (2002). How Children Experience Brief-Exposure Treatment of Specific Phobias. *Journal of Clinical Child and Adolescent Psychology*, 31(1), 80–89.
- Taani, D. Q. (2002). Dental attendance and anxiety among public and private school children in Jordan. *International Dental Journal*, 52(1), 25–9.
- Tellez, M., Potter, C. M., Kinner, D. G., Jensen, D., Waldron, E., Heimberg, R. G., ... Ismail, a. I. (2015). Computerized Tool to Manage Dental Anxiety: A Randomized Clinical Trial. *Journal of Dental Research*, 94(9 Suppl), 174–180.
- Thibodeau, E., & Mentasti, L. (2007). Who stole Nemo? *Journal of the American Dental Association* (1939), 138(5), 656–660. <http://doi.org/10.14219/jada.archive.2007.0238>
- Uman, L. S., Birnie, K. a, Noel, M., Parker, J. a, Chambers, C. T., McGrath, P. J., & Kisely, S. R. (2013). Psychological interventions for needle-related procedural pain and distress in children and adolescents. *The Cochrane Database of Systematic Reviews*, 10(10).
- UN. (2016). UN. Convention on the Rights of the Child. Retrieved October 14, 2016, from <http://www2.ohchr.org/english/law/crc.htm>
- Wahlund, T. (2008). *Injection phobi scale for children*. Stockholm University.
- Wide Boman, U., Broberg, A. G., Krekmanova, L., Staberg, M., Svensson, C., & Robertson, A. (2014). An explorative analysis of the recruitment of patients to a randomised controlled trial in adolescents with dental anxiety. *Swedish Dental Journal*, 38(1), 47–54.
- Wide Boman, U., Carlsson, V., Westin, M., & Hakeberg, M. (2013). Psychological treatment of dental anxiety among adults: A systematic review. *European Journal of Oral Sciences*, 121, 225–234.
- Vigerland, S., Lenhard, F., Bonnert, M., Lalouni, M., Hedman, E., Åhlén, J., ... Ljótsson, B. (2016). Internet-delivered cognitive behavior therapy for children and adolescents: A systematic review and meta-analysis. *Clinical Psychology Review*, 50, 1–10.
- Vigerland, S., Ljótsson, B., Thulin, U., Öst, L.-G., Andersson, G., & Serlachius, E. (2016). Internet-delivered cognitive behavioural therapy for children with anxiety disorders: A randomised controlled trial. *Behaviour Research and Therapy*, 76, 47–56.
- Vika, M., & Liljehaug Agsal, M. (2013). Intra-Oral Injection Phobia. In L.-G. Öst & E. Skaret (Eds.), . John Wiley & Sons, Ltd.

- Vika, M., Skaret, E., Raadal, M., Öst, L. G., & Kvale, G. (2008). Fear of blood, injury, and injections, and its relationship to dental anxiety and probability of avoiding dental treatment among 18-year-olds in Norway. *International Journal of Paediatric Dentistry*, 18(3), 163–169.
- Willumsen, T., Haukebø, K., & Raadal, M. (2013). Aetiology of Dental Phobia. In L.-G. Öst & E. Skaret (Eds.), *Cognitive Behaviour Therapy for dental Phobia and Anxiety*. John Wiley & Sons.
- Von Knorring, L., Lundberg, V. a, Beckman, V., Bejerot, S., Berg, R., Björkelund, C., ... Gren, H. (2005). Treatment of Anxiety Disorders: A Systematic Review. Retrieved October 24, 2016, from <http://www.sbu.se/en/publications/sbu-assesses/treatment-of-anxiety-disorders2/>
- Wuthrich, V. M., Rapee, R. M., Cunningham, M. J., Lyneham, H. J., Hudson, J. L., & Schniering, C. A. (2012). A Randomized Controlled Trial of the Cool Teens CD-ROM Computerized Program for Adolescent Anxiety. *Journal of the American Academy of Child & Adolescent Psychiatry*, 51(3), 261–270.
- Öhman, A., & Mineka, S. (2001). Fears, phobias, and preparedness: Toward an evolved module of fear and fear learning. *Psychological Review*, 108(3), 483–522. Öst. (1989). One-session treatment for specific phobias. *Behaviour Research and Therapy*, 27(1), 1–7.
- Öst, L-G.; & Clark, D. M. (2013). Cognitive Behaviour Therapy: Principles, Procedures and Evidence Base. In L. Öst & E. Skaret (Eds.), *Cognitiv Behaviour Therapy for Dental Phobia and Anxiety*. Wiley & Sons, Ltd.
- Öst, L-G., Hellström, K., & Kåver, A. (1992). One versus five sessions of exposure in the treatment of injection phobia. *Behavior Therapy*, 23(2), 263–281.
- Öst, L-G., & Hugdahl, K. (1985). Acquisition of blood and dental phobia and anxiety response patterns clinical patients. *Behaviour Research and Therapy*, 23(1), 27–34.
- Öst, L-G., (1989). One-session treatment for specific phobias. *Behaviour Research and Therapy*, 27(1), 1–7.
- Öst, L-G., & Kvale, G. (2013). Effects of Cognitive Behavioral Treatment: A Systematic Review and Meta-Analysis. In L.G. Öst & E. Skaret (Eds.), *Cognitiv Behaviour Therapy for Dental Phobia and Anxiety* (pp. 163–183). Wiley & Sons, Ltd.
- Öst, L-G., (2010). Det empiriska stödet för KBT vid psykiska störningar hos barn och ungdomar. In L. G. Öst (Ed.), *KBT inom barn-och ungdomspsykiatrin*. Stockholm: Natur & Kultur.
- Öst, L-G., & Skaret, E. (2013). Future Research and Applications. In Öst & E. Skaret (Eds.), *Cognitive Behaviour Therapy for dental Phobia and Anxiety* (pp. 221–231). John Wiley & Sons, Ltd.